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## Tuesday, April 1

1:30 PM - 3:15 PM

**2C1 - Security**

**Room:** Drawing Room

**Session Chair:** Mr. George Rebovich, Jr. (*The MITRE Corporation, USA*)

**CyMRisk: An Approach for Computing Mission Risk due to Cyber Attacks**

1

Thomas Llansó (*The Johns Hopkins University Applied Physics Laboratory, USA*)

Eric Klatt (*The Johns Hopkins University Applied Physics Laboratory, USA*)

**A Security Engineering Process for Systems of Systems using Security Patterns**

8

Jose Fran. Ruiz (*Fraunhofer SIT, Germany*)

Carsten Rudolph (*Fraunhofer SIT, Germany*)

Antonio Maña (*University of Malaga, Spain*)

Marcos Arjona (*University of Malaga, Spain*)

**An Actionable Framework for System of Systems and Mission Area Security Engineering**

12

J. Dahmann (*The MITRE Corporation, USA*)

G. Rebovich (*The MITRE Corporation, USA*)

G. Turner (*The MITRE Corporation, USA*)

**2C2 - Control Systems**

**Room:** MacDonald

**Session Chair:** Dr. Emil Petriu (*University of Ottawa, Canada*)

**Unmanned Aerial Vehicle Formation Flying using Linear Model Predictive Control**

18

M. Iskandarani (*Royal Military College of Canada, Canada*)

S. N. Givigi (*Royal Military College of Canada, Canada*)

G. Fusina (*Defence R&D Canada - Ottawa, Canada*)

A. Beaulieu (*Royal Military College of Canada, Canada*)

**Distributed Optimal Control of a Network of Virtual Power Plants with Dynamic Price Mechanism**

24

Hanane Dagdougui (*Department of Electrical Engineering (ETS), Canada*)

Ahmed Ouammi (*National Centre for the Scientific and Technical Research, Rabat, Morocco*)

Roberto Sacile (*University of Genoa, Italy*)
Model-Free Tuning Solution for Sliding Mode Control of Servo Systems

Radu-Emil Precup (Politehnica University of Timisoara, Romania)
Mircea-Bogdan Radac (Politehnica University of Timisoara, Romania)
Claudia-Adina Dragos (Politehnica University of Timisoara, Romania)
Stefan Preitl (Politehnica University of Timisoara, Romania)
Emil M. Petriu (University of Ottawa, Canada)

2C3 - Service Systems
Room: Palladian
Session Chair: Dr. Cairo Nascimento, Jr. (ITA, Brazil)

Efficient Link Management for the Wireless Communication of an Ocean Current Turbine Testbed

Ionut Cardei (Florida Atlantic University, USA)
Anthony Marcus (Florida Atlantic University, USA)
Gabriel Alsenas (Florida Atlantic University, USA)

PHM-Based Multi-UAV Task Assignment

Ivo Paixão de Medeiros (EMBRAER, Brazil)
Leonardo Ramos Rodrigues (EMBRAER, Brazil)
Elcio Hideiti Shiguemori (DCTA, Brazil)
Rafael Santos (INPE, Brazil)
Cairo Lúcio Nascimento, Júnior (ITA, Brazil)

Crowdsourcing for Public Safety

Allan Goncalves (Kean University, USA)
Patricia Morreale (Kean University, USA)
Carlos Silva (Kean University, USA)
Jason Bonafide (Kean University, USA)

3:30 PM - 5:45 PM
2D1 - Machine Learning
Room: Drawing Room
Session Chair: Dr. Alain Beaulieu (Royal Military College of Canada, Canada)

Planning and Learning for Cooperative Construction Task with Quadrotors

Sérgio Ronaldo Barros dos Santos (Instituto Tecnológico de Aeronáutica, Brazil)
Cairo Lúcio Nascimento, Júnior (Instituto Tecnológico de Aeronáutica, Brazil)
Sidney N. Givigi Jr. (Royal Military College of Canada, Canada)
Cost-Optimal, Robust Charging of Electrically-Fueled Commercial Vehicle Fleets via Machine Learning

Jigar Shah (GE Global Research, USA)
Matthew Nielsen (GE Global Research, USA)
Andrew Reid (GE Global Research, USA)
Conner Shane (GE Global Research, USA)
Kirk Mathews (GE Global Research, USA)
David Doerge (GE Global Research, USA)
Richard Piel (GE Global Research, USA)
Roger Anderson (Columbia University in the City of New York, USA)
Albert Boulanger (Columbia University in the City of New York, USA)
Leon Wu (Columbia University in the City of New York, USA)
Vaibhav Bhandari (Columbia University in the City of New York, USA)
Ashish Gagneja (Columbia University in the City of New York, USA)
Arthur Kressner (Columbia University in the City of New York, USA)
Xiaohu Li (Columbia University in the City of New York, USA)
Somnath Sarkar (Columbia University in the City of New York, USA)

Can Smartphones be Used to Detect an Earthquake? Using a Machine Learning Approach to Identify an Earthquake Event

Alham Fikri Aji (Universitas Indonesia, Indonesia)
I Putu Edy Suardiyana Putra (Universitas Indonesia, Indonesia)
Petrus Mursanto (Universitas Indonesia, Indonesia)
Setiadi Yazid (Universitas Indonesia, Indonesia)

FPGA Implementation of Multiple Pursuit-Evasion Games with Decentralized Learning Automata

Shuli Gao (Royal Military College of Canada, Canada)
Sidney N. Givigi (Royal Military College of Canada, Canada)
Alain JG Beaulieu (Royal Military College of Canada, Canada)

2D2 - Engineering Processes for Complex Systems
Room: MacDonald
Session Chair: Mr. Daniel Kasperek (Technische Universität München, Germany)

Structure-based Analysis of Dynamic Engineering Process Behavior

Daniel Kasperek (Technische Universität München, Germany)
Sebastian Maisenbacher (Technische Universität München, Germany)
Maik Maurer (Technische Universität München, Germany)

Modelling Effective Product Development Systems as Network-of-Networks

Alexander Hultin (University of Bath, United Kingdom)
Theo Tryfonas (University of Bristol, United Kingdom)
Nigel Johnston (University of Bath, United Kingdom)
Martin Kirkman (Aero Engine Controls, United Kingdom)

A Comprehensive Basis for Systems Engineering Theory

Konstantinos P Triantis (Virginia Polytechnic Institute and State University, USA)
Paul D Collopy (University of Alabama in Huntsville, USA)
Managing Systems Engineering Processes: a Multi-Standard Approach

Rui Xue (University of Toulouse, France)
Claude Baron (LAAS-CNRS, France)
Philippe Esteban (1 CNRS, LAAS, France)
Hamid Demmou (LAAS-CNRS, France)

2D3 - Systems Reliability
Room: Palladian
Session Chair: Dr. Rui Zhang (CORA- DRDC, Canada)

Detailed Cannibalization Decision Making for Maintenance Systems in the Military Context

Rui Zhang (CORA- DRDC, Canada)
Ahmed Ghanmi (CORA- DRDC, Canada)

GeoClouds Modes: A Performability Evaluation Tool for Disaster Tolerant IaaS Clouds

Bruno Silva (Center for Informatics & Federal University of Pernambuco, Brazil)
Paulo Maciel (Center for Informatics & Federal University of Pernambuco, Brazil)
Jonathan Brilhante (Center for Informatics & Federal University of Pernambuco, Brazil)
Armin Zimmermann (System and Software Engineering, Ilmenau University of Technology, Germany)

An Empirical Path Loss Model for Wireless Sensor Network Deployment in a Concrete Surface Environment

Abdulaziz Alsayyari (Florida Institute of Technology, USA)
Ivica Kostanic (Florida Institute of Technology, USA)
Carlos E. Otero (Florida Institute of Technology, USA)

Safety Management Method in Complex System Engineering

Romaric Guillerm (LAAS-CNRS, France)
Hamid Demmou (LAAS-CNRS, France)

2D4 - Systems of Systems
Room: Burgandy
Session Chair: Dr. Claire Ingram (Newcastle University, United Kingdom)

A Model Driven Service Engineering Approach to System of Systems

Jianpeng Hu (Shanghai Jiao Tong University, P.R. China)
Linpeng Huang (Shanghai Jiao Tong University, P.R. China)
Xuling Chang (Shanghai Jiao Tong University, P.R. China)
Bei Cao (Shanghai Jiao Tong University, P.R. China)

Modelling Patterns for Systems of Systems Architectures

Claire Ingram (Newcastle University, United Kingdom)
Richard Payne (Newcastle University, United Kingdom)
Simon Perry (Atego, United Kingdom)
Jon Holt (Atego, United Kingdom)
Finn Overgaard Hansen (Aarhus University, Denmark)
Luis Diogo Couto (Aarhus University, Denmark)
Collaborative Formal Modeling of System of Systems

Claus Ballegaard Nielsen (Aarhus University, Denmark)
Peter Gorm Larsen (Aarhus University, Denmark)

Applying System of Systems Engineering to Enable Component-level Modularity in Communications Systems

Patrick Maurer (The MITRE Corporation, USA)
Ting-Shuo Che (The MITRE Corporation, USA)
Donald Broderick (The MITRE Corporation, USA)
Edward Burke (The MITRE Corporation, USA)
### 3A1 - Human-Machine Interaction

**Room:** Drawing Room  
**Session Chair:** Dr. José Azorín (Miguel Hernández University of Elche, Spain)

**First steps in the development of an EEG-based system to detect intention of gait initiation**

D. Planelles (Miguel Hernández University of Elche, Spain)  
E. Hortal (Miguel Hernández University of Elche, Spain)  
A. Costa (Miguel Hernández University of Elche, Spain)  
E. Iáñez (Miguel Hernández University of Elche, Spain)  
José M. Azorín (Miguel Hernández University of Elche, Spain)

**Brain-Machine Interface System to Differentiate between Five Mental Tasks**

Enrique Hortal (Miguel Hernández University of Elche, Spain)  
Daniel Planelles (Miguel Hernández University of Elche, Spain)  
Andrés Úbeda (Miguel Hernández University of Elche, Spain)  
Álvaro Costa (Miguel Hernández University of Elche, Spain)  
José M. Azorín (Miguel Hernández University of Elche, Spain)

**Sound Transmission through the Human Body with Digital Weaver Modulation (DWM) Method**

Sung-Eun Kim (Electronics and Telecommunications Research Institute, Korea)  
Taewook Kang (Electronics and Telecommunications Research Institute, Korea)  
Junghwan Hwang (Electronics and Telecommunications Research Institute, Korea)  
Sungweon Kang (Electronics and Telecommunications Research Institute, Korea)  
Kyoughwan Park (Electronics and Telecommunications Research Institute, Korea)

### 3A2 - Research in Systems Engineering I

**Room:** MacDonald  
**Session Chair:** Dr. Maik Maurer (Technische Universität München, Germany)

**A survey on complexity management in systems engineering**

Maik Maurer (Technische Universität München, Germany)  
Roland Schneller (Technische Universität München, Germany)  
Mayada Omer (Technische Universität München, Germany)

**Between Inspection and Innovation The Central Role of the Peer Review in Systems Engineering**

Paul D. Nugent (Western Connecticut State University, USA)

**Reference process for the development of an engineering strategy**

Michael Gepp (University Erlangen-Nuremberg, Germany)  
Florian Steinmann (University Erlangen-Nuremberg, Germany)  
Andreas Schertl (Siemens AG, Corporate Technology, Germany)  
Jan Vollmar (Siemens AG, Corporate Technology, Germany)
3A3 - Program/Project Management for Complex Systems I
Room: Palladian
Session Chair: Ms. Jin Zhu (Florida International University, USA)

Knowledge Management for Metrics: Enabling Analysis and Dissemination of Metrics
Thomas Walworth (University of Bristol, United Kingdom)
Mike Yearworth (University of Bristol, United Kingdom)
Laura Shrieves (Thales Corporate Services, United Kingdom)

Systems Thinking For Rapid Decision Making In Industrial Contexts
Darren John Winter (GKN Aerospace, Western Approach, United Kingdom)
Paul Ashton-Rickardt (GKN Aerospace, Western Approach, United Kingdom)
Carwyn Ward (University of Bristol, United Kingdom)
Mike Yearworth (University of Bristol, United Kingdom)
Chris McMahon (University of Bristol, United Kingdom)
Kevin Potter (University of Bristol, United Kingdom)

Jin Zhu (Florida International University, USA)
Ali Mostafavi (Florida International University, USA)

3A4 - Urban and Environmental Considerations
Room: Burgandy
Session Chair: Mr. Mohamad Iskandarani (Royal Military College of Canada, Canada)

A Block Based E2E Forwarding Delay Model for Delay Sensitive VANETs in City Environments
Mir Tafseer Nayeem (Islamic University of Technology (IUT), Bangladesh)
Md. Mamunur Rashid Akand (Islamic University of Technology (IUT), Bangladesh)
Mahmudun Nabi (Islamic University of Technology (IUT), Bangladesh)
Md. Rokon Uz Zaman Sumon (Islamic University of Technology (IUT), Bangladesh)
Muhammad Mahbub Alam (Islamic University of Technology (IUT), Bangladesh)

A Multi-Attribute Decision Support Framework for Conventional Generation Capacity Expansion
Waleed Gowharji (Center For Complex Engineering Systems, Saudi Arabia)
Abdulelah Habib (Center For Complex Engineering Systems, Saudi Arabia)
Ross D. Collins (Massachusetts Institute of Technology, USA)
Rayed Al Wajeeh (Center For Complex Engineering Systems, Saudi Arabia)
Ahmad AlAbdulkareem (Center For Complex Engineering Systems, Saudi Arabia)
Anas Alfaris (Center For Complex Engineering Systems, Saudi Arabia)
Stephen R Connors (Massachusetts Institute of Technology, USA)

Evaluating Army Geospatial Data Analysis Tools
Breawna Davis (United States Military Academy, USA)
Alexandra Sutherland (United States Military Academy, USA)
Raymond Maples (United States Military Academy & United States Army, USA)
Megan Wilton (United States Military Academy, USA)
10:15 AM - 12:00 PM
3B1 - Model-Based Systems Engineering I
Room: Drawing Room
Session Chair: Dr. Alain Beaulieu (Royal Military College of Canada, Canada)

Modeling and Direct Adaptive Control of Utility-Scale Wind Turbines for both Onshore and Offshore Operation

Kaman Thapa Magar (University of Wyoming, USA)
Mark J. Balas (University of Wyoming, USA)

Impact of Dynamic Priority Scheme on IP Multimedia Subsystem

Lava Al-Doski (Niksun, inc, USA)
Seshadri Mohan (University of Arkansas at Little Rock, USA)

Impact of Information Sharing on Energy Behavior: A System Dynamics Approach

Nasrin Khansari (Stevens Institute of Technology, USA)
Ali Mostashari (Stevens Institute of Technology, USA)
Mo Mansouri (Stevens Institute of Technology, USA)

3B2 - Systems Architectures I
Room: MacDonald
Session Chair: Dr. Paul C. Hershey (Raytheon, Inc., USA)

System Architecture for Dynamic Mission Services Orchestrator (DMSO)

Paul Hershey (Raytheon, Inc., USA)
Dan Clark (Raytheon, USA)
David Wisniewski (Raytheon, USA)

Defining a Method for Identifying Architectural Candidates as Part of Engineering a System Architecture

Joakim Fröberg (Mälardalen University, Sweden)
Stig Larsson (Mälardalen University, Sweden)
Sara Dersten (Mälardalen University, Sweden)
Per-Ake Nordlander (BAE Systems, Sweden)

3B3 - Program/Project Management for Complex Systems II
Room: Palladian
Session Chair: Mr. Jeffrey Levin (Johns Hopkins University Applied Physics Laboratory, USA)

Value of Bottom-up Team Formation for Complex Adaptive Business Systems

Hari Prasad, Devarapalli (Tata Consultancy Services, India)
Hanumad Vasanth, Munnamgi (Tata Consultancy Services, India)

Performance Assessment of Outsourced Service Engagements: Leveraging Economic Theories Based Critical Success Factors

Veerendra K Rai (Tata Consultancy Services, India)
Sanjit Mehta (Tata Consultancy Services, India)
Detecting Antifragile Decisions and Models Lessons from a Conceptual Analysis Model of Service Life Extension of Aging

Jeffrey S. Levin (Johns Hopkins University Applied Physics Laboratory, USA)
Steven P. Brodfuehrer (Johns Hopkins University Applied Physics Laboratory, USA)
William M. Kroshl (Johns Hopkins University Applied Physics Laboratory, USA)

130 PM - 3:15 PM
3C1 - Model-Based Systems Engineering II
Room: Drawing Room
Session Chair: Dr. Takayuki Kuroda (NEC Corporation, USA)

Model-based Automation for Hardware Provisioning in IT Infrastructure
Takayuki Kuroda (NEC Corporation, USA)
Aniruddha Gokhale (Vanderbilt University, USA)

Identifying the Adequate Level of Abstraction Within Structural Modeling
Michael Roth (Technische Universität München, Germany)
Daniel Kasperek (Technische Universität München, Germany)
Udo Lindemann (Technische Universität München, Germany)

Model-Based Systems Engineering for Design and Automated Operation of Modern Waterway Systems
Leonard Petnga (University of Maryland, USA)
Mark Austin (University of Maryland, USA)

3C2 - System Architectures II
Room: MacDonald
Session Chair: Dr. Paul C. Hershey (Raytheon, Inc., USA)

Cloud-Based Mission Observation, Response, Exploitation (CMORE) System
Paul Hershey (Raytheon, Inc., USA)
Charles B. Silio Jr. (University of Maryland, USA)
Akshay Narayan (National University of Singapore, Singapore)
Shrisha Rao (International Institute of Information Technology, Bangalore, India)

Introduction of Human Views into Operational Capability Development within an Architectural Framework
Robert A Sharples (Airbus Defence and Space & Airbus, United Kingdom)

A Simulation-Based System Design Tool for Avionic Fiber-Optical Networks
Sven Jäger (Ilmenau University of Technology, Germany)
Armin Zimmermann (Ilmenau University of Technology, Germany)
Ralph Maschotta (Ilmenau University of Technology, Germany)
3C3 - Systems Engineering I
Room: Palladian
Session Chairs: Dr. Timothy Ferris (Defence and Systems Institute, University of South Australia, Australia)

Cross-cultural Leadership in the Implementation of Systems Engineering Processes: A Study of Indonesian Expatriate Engineers
Ika S. Windiarti (Defence and Systems Institute, University of South Australia, Australia)
Timothy L.J. Ferris (Defence and Systems Institute, University of South Australia, Australia)
Matthew J. Berryman (SMART Infrastructure Facility, University of Wollongong, Australia)

Indonesia's Cultural Background in Productivity and Performance in the Implementation of SE Processes: Indonesian Expatriate Engineers' Awareness
Ika S. Windiarti (Defence and Systems Institute, University of South Australia, Australia)
Timothy L.J. Ferris (Defence and Systems Institute, University of South Australia, Australia)
Matthew J. Berryman (SMART Infrastructure Facility, University of Wollongong, Australia)

Assessing the Informative Value of Complexity Metrics Within Design Structure Matrices in Early Development Phases of Complex Systems
Daniel Kasperek (Technische Universität München, Germany)
Stefanie Fink (Technische Universität München, Germany)
Sebastian Maisenbacher (Technische Universität München, Germany)
Wolfgang Bauer (Technische Universität München, Germany)
Maik Maurer (Technische Universität München, Germany)

3C4 - Modeling and Simulation I
Room: Burgandy
Session Chair: Mr. James Jessup (Royal Military College of Canada, Canada)

On the entropy of the predator-prey model
A. Balestrino (Second University of Napoli, Italy)
A. Cavallo (Second University of Napoli, Italy)
G. De Maria (Second University of Napoli, Italy)

Applying Quadrotor Aircraft to Dynamic Encirclement
A. T. Hafez (Queens University, Canada)
M. Iskandarani (Royal Military College of Canada, Canada)
S. N. Givigi (Royal Military College of Canada, Canada)
S. Yousefi (Queens University, Canada)
A. Beaulieu (Royal Military College of Canada, Canada)

Merging of Octree Based 3D Occupancy Grid Maps
J. Jessup (Royal Military College of Canada, Canada)
S. N. Givigi (Royal Military College of Canada, Canada)
A. Beaulieu (Royal Military College of Canada, Canada)
Extended Mechatronic Systems Architecture Modeling with SysML for Enhanced Safety Analysis

Faida Mhenni (SUPMECA Paris, France)
Jean-Yves Choley (SUPMECA Paris, France)
Nga Nguyen (EISTI, France)

Model-Driven Interface Management A practical approach to systems engineering in large-scale international research projects

Marco Di Maio (Model Driven Management, United Kingdom)

Approach to Capability-Based System-of-Systems Framework in Support of Naval Ship Design

Jacques P Olivier (Department of National Defence, Canada)
Santiago Balestrini-Robinson (Georgia Tech Research Institute, USA)
Simon Briceño (Georgia Institute of Technology, USA)

GA Optimization of Ladder-Structured GOBF Models

Jeremias Barbosa Machado (Federal University of Itajuba, Brazil)

ELOTS: Energy-Efficient Local Optimization Time Synchronization Algorithm for WirelessHART Networks

Mingjie Fang (Wuhan Second Ship Design&Research Institute, P.R. China)
Yuping Sun (Wuhan Second Ship Design&Research Institute, P.R. China)
Xiaohui Zhang (Wuhan Second Ship Design&Research Institute, P.R. China)
Jianhua Sun (Wuhan Second Ship Design&Research Institute, P.R. China)

Rationalizing Approaches to Multi-objective Optimization in Systems Architecture Design

Omar Hammami (ENSTA, France)
Marc Houllier (ENSTA, France)

SYNSYS-ME: Seamless System Engineering to Mechanical Flow Through Multiobjective Optimization and Requirements Analysis

Omar Hammami (ENSTA PARISTECH, France)

Analyzing Collaboration in Self-Organizing Complex Systems of Flow

Lehner Stephan (German Aerospace Center, Germany)
Volker Gollnick (German Aerospace Center, Germany)
Swaroop Nishant (School of Aeronautics and Astronautics, USA)
Perspectives on System of Systems for Pilgrimage Ritual Guidance and Management

Sami S. Alwakeel (King Saud University, Saudi Arabia)
Mohammed M. Alwakeel (University of Tabuk, Saudi Arabia)

Developing a Framework to Establish Collaborative Enterprise Networks

Andrew Hale (University of Bristol & Frazer Nash Consultancy, United Kingdom)
Leroy White (University of Bristol, United Kingdom)

Engineering the Organization: Providing New Insights Into Organizational Design Using Systems Principles

Patrick Tully (University of Bristol & Frazer-Nash Consultancy, United Kingdom)
Edward Goddard (Frazer-Nash Consultancy, United Kingdom)
Elliott Parsons (University of Bristol & Frazer-Nash Consultancy, United Kingdom)

3D4 - Robotics

Room: Burgandy
Session Chair: Dr. Cairo Nascimento, Jr. (Instituto Tecnológico de Aeronáutica, Brazil)

An Integrated Vision-Guided Robotic System for Rapid Vehicle Inspection

R. Fareh (University of Ottawa, Canada)
P. Payeur (University of Ottawa, Canada)
D. Nakhaeinia (University of Ottawa, Canada)
R. Macknojia (University of Ottawa, Canada)
A. Chávez-Aragón (University of Ottawa, Canada)
A.-M. Cretu (University of Ottawa, Canada)
P. Laferriere (University of Ottawa, Canada)
R. Laganière (University of Ottawa, Canada)
R. Toledo (University of Ottawa, Canada)

Autonomous Feature-based Exploration using a Low-Cost Mobile Robot

Luciano Buonocore (Universidade Federal do Maranhão, Brazil)
Areolino de Almeida Neto (Universidade Federal do Maranhão, Brazil)
Cairo Lúcio Nascimento Júnior (Instituto Tecnológico de Aeronáutica, Brazil)

Steering a Quadruped Robot: Simulation and Experimental Results

Alessandro Paolone de Medeiros (Instituto Tecnológico de Aeronáutica, Brazil)
Jeeves Lopes dos Santos (Instituto Tecnológico de Aeronáutica, Brazil)
Cairo Lúcio Nascimento Júnior (Instituto Tecnológico de Aeronáutica, Brazil)