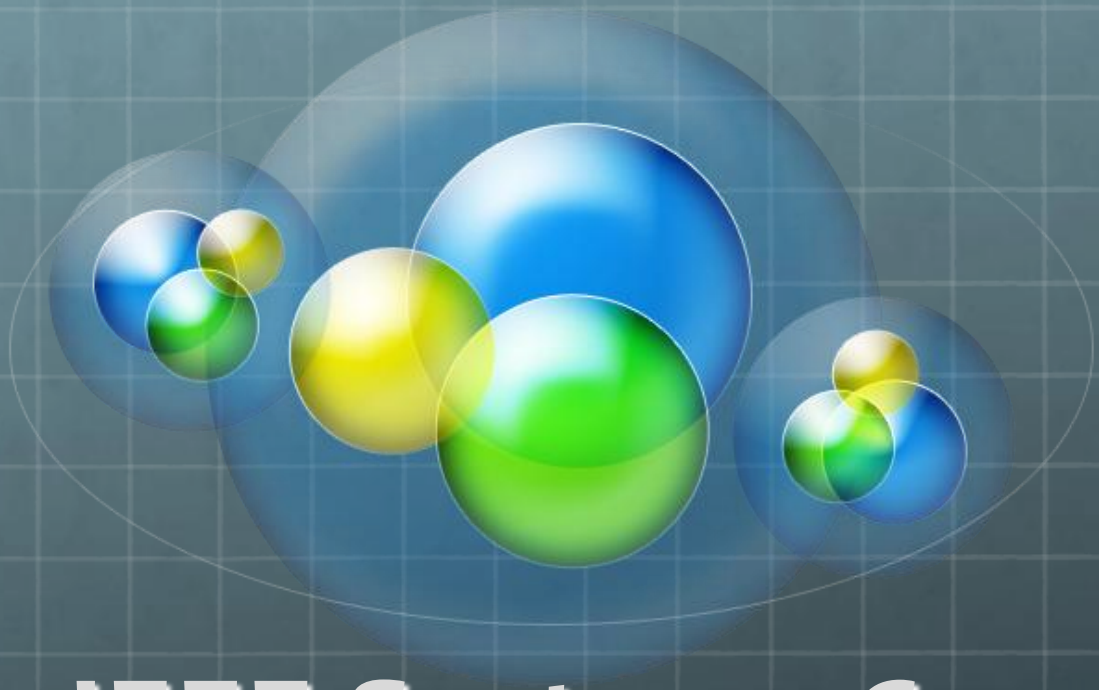


# The IEEE Systems Council Theory vs Practice

*Presented by Roger Oliva, AESS, 9/29/15, Rome, Italy*
*11/13/15 – Reconvened Virtually*

# Friends, Romans, Countrymen…

- … lend me your ears.

I bet you didn't know…

# Q & A

- What does an engineer do for/in the Systems Council?
- Proposed answer:  Exploits an infrastructure that enables the value-oriented technical solution to a complex problem

# Enabling Engineers

- Existing Technical Committee Structure
- Proposed Technical Committee Structure
- TC Structure - in pursuit
- Accomplishments
- New Activities
  - WFD Perspectives
  - Today's Workshop
  - IEEE Environmental Engineering Initiative
  - Value Engineering
- Media Requests
- Awards
- Systems Issues to consider in the Future

# Existing Technical Committee Structure and Plans

- Strategic Planning
- Analytics and Risk (D. Wu, and 20 others)
- Intelligent Transportation Design (L. McAliley – B. Fong, and 4 others)
- Large Scale Systems Integration Monitoring Critical Infrastructure (S. Leuchter, reinvigorating)
- Security and Privacy in Complex Systems (Shiyan Hu, and 5 others)
- Workforce Development (R. Milham and 3 others, Systems Engineering Education)

# Existing Technical Committee Structure (cont)

- Systems Biology (L Chen and 7 others may evolve into Healthcare)
- Standards (L. McAliley , reinvigorating)
- Industrial Interface (M. Nichols – Manufacturing and Systems Engineering in Business and Finance)

# Proposed Technical Committee Structure

Those that “exist” today plus…

- High Speed Rail
- Power Integration (of Evolving Battery and Fuel Cell Technology)
- Geospatial Nuclear Materials/Energy Safety
- GEOSS
- Linking Physical Sciences to Systems Engineering
- Service Engineering
- Information Fusion
- Environmental Protection

# Accomplishments

- Inaugural 2015 IEEE Symposium on Analytics and Risk in Complex Management Systems (ISARCRM 2015) on August 14-16, 2015, at the School of Economics and Management, University of Chinese Academy of Science, Beijing, China.
- University of Virginia and ARTC hosted talk by AESS President, Bob Lyons, at the Dept. of Systems & Information Engineering, University of Virginia, Charlottesville, VA,  September 11, 2015

# Workforce Development Perspectives for the Council

- Traditional tech education inadequate, highlighted in these systems
- Need to be more broader and multi-disciplinary
- Common terminology required
- More focus on engineering for consumer/business focus; team work
- Engineering in different domains (ex: software vs hardware) which involves educating to consider different stakeholder viewpoints and globalisation factors

# More Workforce Development Perspectives

- Role of project leader: technical expertise with people management (additional skills to be taught)
- Examples of diversities:
- Africa:
  - Cost sensitivity
  - Lack of needed expertise
  - Illiteracy
  - Diverse cultures

# And more Workforce Development Perspectives

- Europe:
  - Different specific eng terminology
  - Different approaches to testing, development, standards, organisations, procedures, et al
  - Different approaches to deadlines and project management
  - Language barriers and mistranslation confusion

# Systems Engineering Workshop Topics (WFD TC)

9/28/15 –Marriott Park Hotel in Rome, Italy

- Agricultural
- Cyber Security
- Emergency Response
- Environmental Protection
- Geology
- Health
- Inhabiting Outer Space
- Oceanic Mining
- Power
- Transportation

SE Workshop Guide and Initial Cut on Value-oriented Metrics

# Other New Activities

- IEEE Environmental Engineering Initiative

  Objective: Create an interdisciplinary forum for nurturing the broad and diverse community interested in the area of environmental engineering, including both the components already active in various S/Cs as well as the components which are using our technologies and methodologies but are not yet embraced by our IEEE communities.

# Environmental Engineering (cont)

Scope: Technologies, methodologies, systems, and applications for environmental engineering, specifically for modeling, monitoring, and control of natural and artificial environments to ensure livability and a sustainable future of the environments as well as well-being of individuals and the community.

The scope includes all aspects related to this specific area in the following fields: sensors, instrumentation, measurements, remote sensing, aerospace technologies and systems, sensor networks, communications, networking, internet of things, information processing, digital architectures, analog/digital circuits, electronic devices and systems, embedded systems, system modeling, signal processing, image processing, data fusion, knowledge extraction and management, big data, complex systems, human interfaces, robotics, industrial informatics, environmental informatics, oceanic engineering, vehicles, transportation, electromagnetic compatibility, microwaves, magnetics, power systems, nuclear systems, reliability, safety, societal implications, technology management, and more. Additional areas to be aggregated may include: environmental sciences, ecology, chemistry, physics, agricultural sciences, pollution analysis and management, and hydraulic systems.

# Environmental Engineering (cont)

Goals and opportunities for IEEE:

- expand knowledge dissemination in the field of interest (conferences, publications, curated collections, webinars, educational activities)
- contributing to aggregating the community in the field of interest, especially embracing interdisciplinary communities which are using technologies in IEEE field of interest but which do not consider IEEE as home
- contribute to expanding people networking in the field of interest
- provide data for informed analysis and decisions (support to public understanding and policy)
- contribute to supporting standardization activities in the field of interest

# Environmental Engineering (cont)

- Our suggest way forward would be to support environmental protection through systems and electro-mechanical engineering. Presuming air, water, land, and space environments – we would initially drop the latter. Space debris, albeit a significant issue in space operations, we will not pursue it as a core endeavor.

We would move forward with the aim of reducing the environmental impact in the following initial list of categories:

- Biomedical hazardous waste
- Radioactive hazardous waste (non-medical, non-energy)
- Nuclear energy byproducts
- Industrial air pollution (including automobile and fossil fuel electricity generation)
- Toxic chemicals released into water or spread on land
- Geographically specific air/water/land pollution mitigation
- Food pathogens
- Water/airborne pathogens

The goal would be to assert electro-chemical systems analysis and/or introduce/support other engineering remedies to these categories.

# Investigation: Value Engineering

- Not a new idea, but maybe the tools and the checkist have improved/evolved.
  - Here is one perspective on value engineering:
    - SAVE International.: http://www.value-eng.org/
  - Are there others? Let's start incorporating the precepts in what we do, today!

# Promoting Systems Studies

- Oil and Gas
- Mass Transit
- Privacy and Intellectual Property vs. Security
- Personalized Medicine
- Space Exploration
- Surveillance (RADAR and others)
- STEM and Focused Education
- Embedded Systems
- Unnecessary Software Complexity
- Electric Vehicles (Ground, Air, Space, and Sea)\
- Nuclear Energy Safeguards
- Engineering Applications from CERN – Dark Matter
- Air Traffic Management
- Smart Grid
- UAV's
- Access to Space - $200/pound
- Brain – Machine Interface

# Media Requests

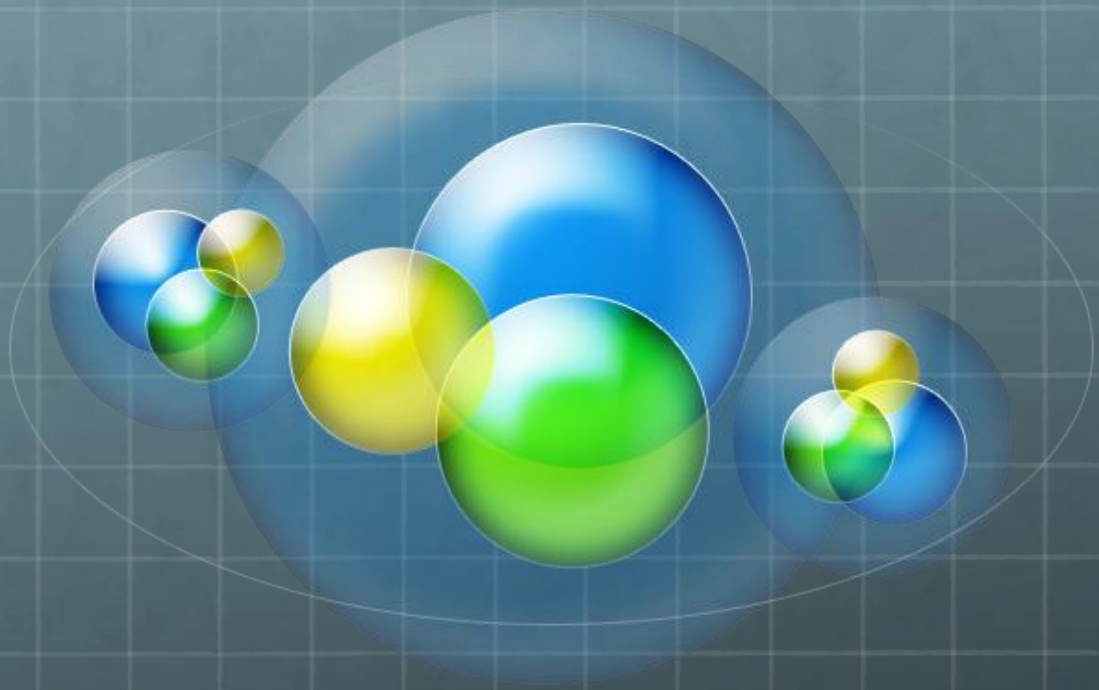
- ARTC wishes to have a publication/magazine. What approach should they take? The Workforce Development TC plans to submit a proposal for a special issue when requests are fielded again. Meanwhile, here is the list (compliments of V. Piuri) of upcoming special issues in our publication:

- 4- Intelligent Internet of Things (IOT)
5- Cognitive-inspired Network Systems (CNS)
6- Traffic Forensics: Systems, Tools, and Experimentations (TFO)
7- Systems-related topics in Robotics & Automation for human health (RAH)
8- Data Mining in Cyber, Physical and Social Computing (CPS)
9- Cognitive-inspired Network Systems (CNS)
10- Insider Threats to Information Security, Digital Espionage and Counter-Intelligence (ITIS)
11- System Safety and Safety-Critical Systems (SSC)
12- Green Pervasive and Ubiquitous Systems (GPUS)
13- Visual Signal Applications over Networks (VSA)
14- Hybrid Intelligence for Internet of Vehicles (HIIOV)
15- Human-Like Intelligence and Robotics (HIR)
16- 5G Wireless Systems with Massive MIMO (5GWS)
17- Green Communications, Computing, and Systems (GCCS)
18- Multimedia Services Provision over Future Mobile Computing Systems (MSP)
19- Industrial IoT Systems and Applications (IIOTSA)
20- Cyber-innovated Environmental Sensing, Monitoring and Modeling for Sustainability (ESM)
21- Risk Analytics in Industrial Systems (RAIS)
22- Communications Technologies and Infrastructures for Smart eHealth Systems
23- Cloud-integrated Cyber-Physical Systems

# Awards for Systems Council Technical Committees

- Recommend one for the best performing technical committee

- Recommend one for the best performing member of the ARTC (Analytics and Risk TC).



# BACKUP SLIDES

# SC: Which Societies "should" be Represented? Other Organizations?

- There are a total of 38 IEEE Societies: http://www.ieee.org/membership_services/membership/societies/index.html
- What about cross-over to other Organizations?
  - ASME (http://www.asme.org/)
  - AIAA (https://www.aiaa.org/)
  - INCOSE (http://www.incose.org/)
  - ACS (http://portal.acs.org/portal/acs/corg/content)
  - AMA (http://www.ama-assn.org/ama)

# Participating Societies

Aerospace and Electronic Systems
Circuits & Systems
**Communications**
**Computational Intelligence**
**Control Systems**
**Instrumentation & Measurement**
**Microwave Theory & Techniques**
**Oceanic Engineering**
**Power Electronics**
**Product Safety Engineering**
**Robotics & Automation**
**Systems, Man, and Cybernetics**

# Value Added

- Enable coordination and concurrent engineering between subject matter experts spanning various societies
- Enable decision analysis and support
- Defines the state-of-the-art in systems engineering
- Provides collaboration opportunities and lessons learned

# Foundations

- Systems Engineering education, standards, processes, methodologies
- Systems Modeling, simulation, integration, resilience
- Robust design, safety & human factors, security, usability, environmental
- Product transition: design, production, test, deployment, disposal
- Program/project management
- Quality Assurance
- Mission Assurance
- Requirements Development & Management
- Risk Management
- Systems Architecture
- Systems-of-Systems

# Goals? Objectives?

- Survey membership?
- Develop more Chapters?
- Establish tangible collaborative efforts?