

INCOSE International Symposium 2019

- Overview of WG Meetings
- Practitioners Challenge – human influence ontology
- Evaluation Ontology update
- Namespace FAF extension

Stephen Powley MEng MIET MINCOSE
Institute for Future Transport and Cities
Coventry University
powleys@uni.coventry.ac.uk

coventry.ac.uk/research/areas-of-research/institute-for-future-transport-and-cities/our-research/systems/

Systems Group



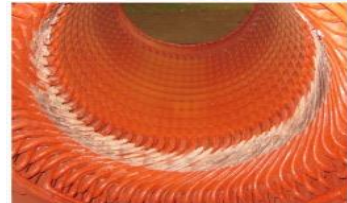
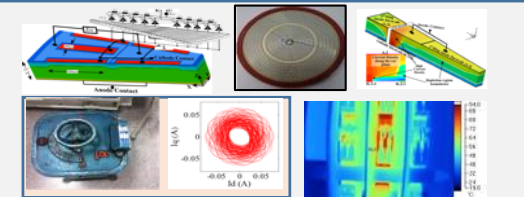
Threat Analysis
Security Validation
Penetration Testing
Software Assurance
Functional Safety (X/VDS)



Hybrid Electric/Electric Vehicles
Autonomous Vehicles
Connected Vehicles



Electrical Machines
Semi-Conductors
Battery Management
Power Drives and Controls



INCOSE/OMG MBSE Patterns Working Group

<https://www.incose.org/incose-member-resources/working-groups/transformational/mbse-patterns>

<http://www.omgwiki.org/MBSE/doku.php?id=mbse:patterns:patterns>

“advance the availability and awareness of practices and resources associated with the impactful creation, application, and continuous improvement of MBSE Patterns over multiple system life cycles”

- Formerly the Pattern-Based Systems Engineering (PBSE) Challenge Team
- Part of the INCOSE/OMG Model-Based Systems Engineering (MBSE) Initiative <http://www.omgwiki.org/MBSE/doku.php>

Chairs

Bill Schindel schindel@icct.com

Troy Peterson tpeterson@systemxi.com

Project Working Pages

[Interface Patterns Team](#)

[Innovation Collaboration Ecology Project with TIMLM WG and PLE WG](#)

[Legacy Product Line Pattern Extraction Project with PLE WG](#)

[Patterns In Systems Of Systems Project with SoS WG](#)

[MBSE Transformation Adoption Pattern Project](#)

[Critical Infrastructure Protection and Recovery Patterns Project with CIPR WG](#)

[Health Care Domain Patterns Project with HC WG](#)

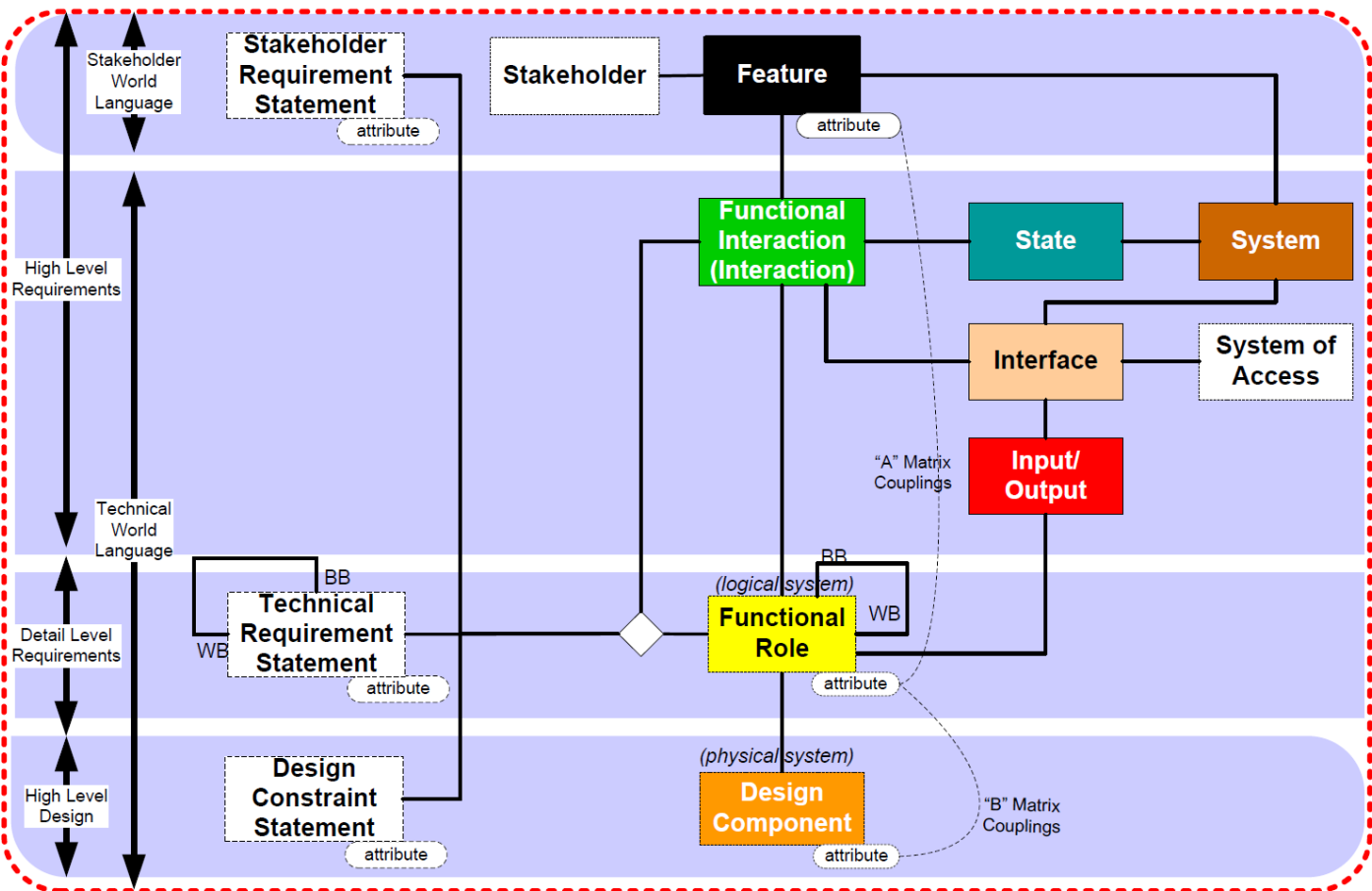
[Verification & Validation of Models Project with ASME Stds Cmtee](#)

[Agile Systems Engineering Life Cycle Management \(ASELCM\) Discovery Project
with ASE WG](#)

[Foundations of Systems Science and Engineering Project with SSWG](#)

Modeling Language Independent S* Metamodel

(S* = Systematica)

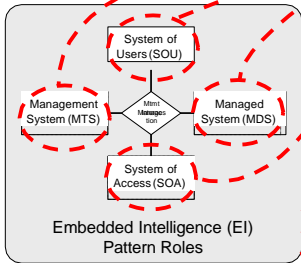
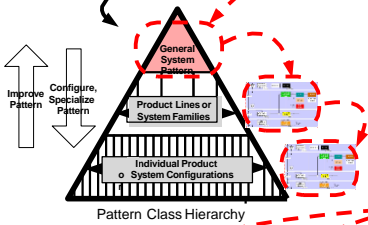




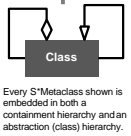
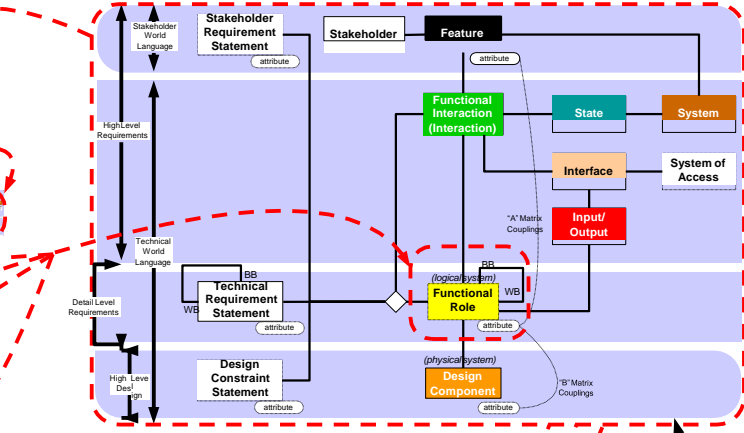
Abbreviated Systematica™ 4.0 Glossary—Ordered by Concept

Generic

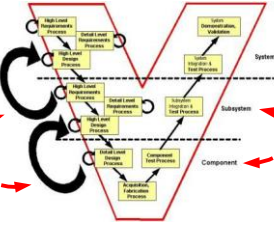
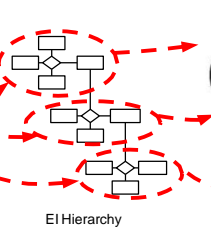
Pattern-Based Systems Engineering (PBSE)



Intelligence-Based Systems Engineering (IBSE)



Every S'Metaclass shown is embedded in both a containment hierarchy and an abstraction (class) hierarchy.

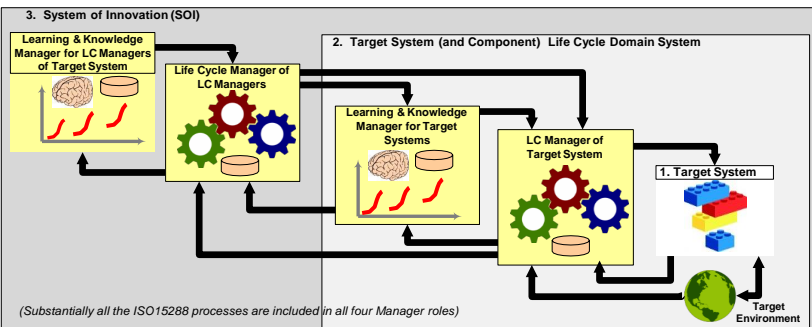


STM Metamodel for Model-Based Systems Engineering (MBSE)

Figure 1: Systematica MBSE Metamodel (informal summary form), Embedded in PBSE and IBSE Frameworks



Introduction to the Agile Systems Engineering Life Cycle MBSE (ASELCM) Pattern



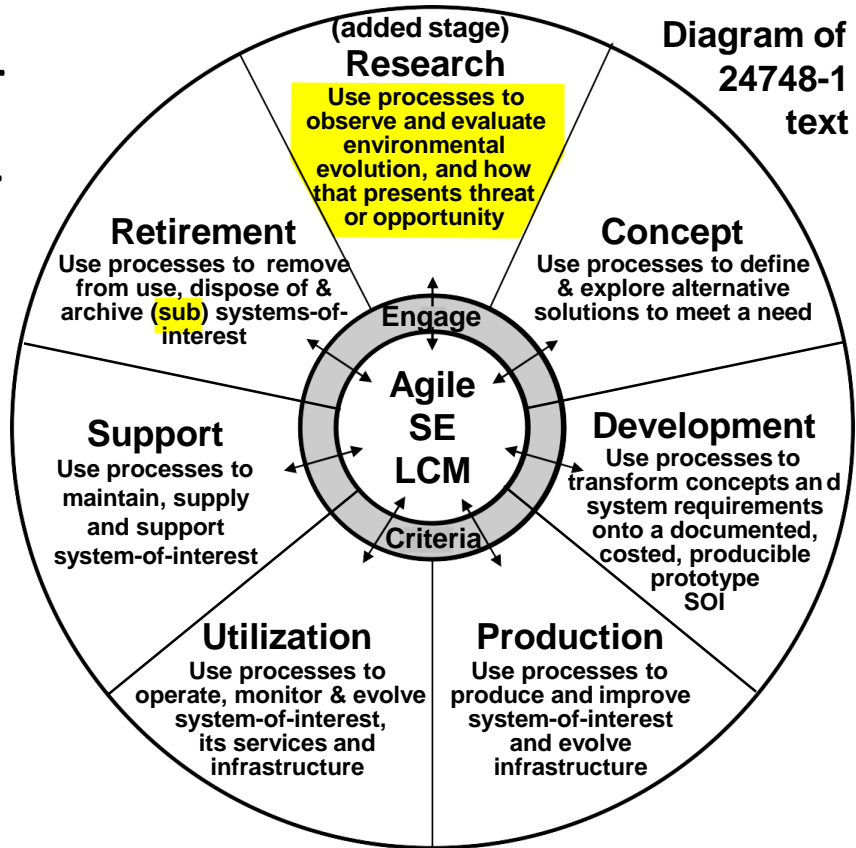
Bill Schindel
schindel@icct.com

Rick Dove
rick.dove@parshift.com

<http://www.parshift.com/ASELCM/Home.html>

Diagram of Asynchronous-Stage Agile SE-LCM

See ISO/IEC TS 24748-1:2016
“Systems and software engineering -- Life cycle management -- Part 1: Guidelines for life cycle management”

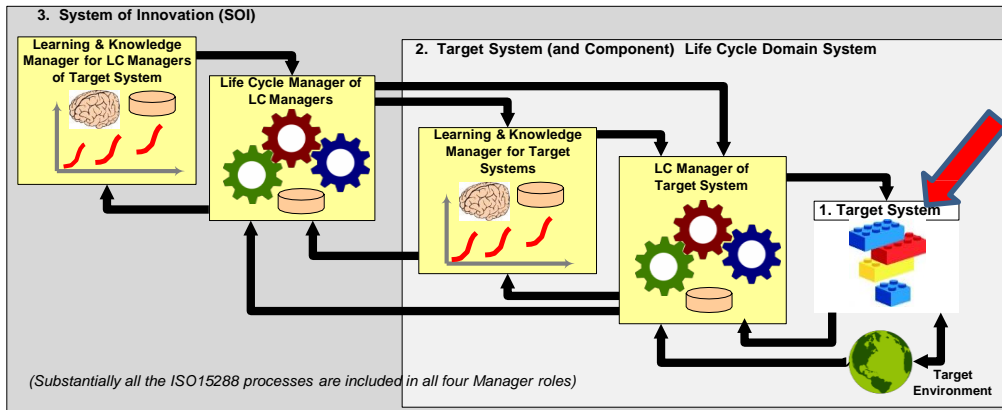


Seven asynchronously-invoked stages can be engaged repetitively and simultaneously to achieve benefit when engagement criteria are met

The Agile System Domain Model

System 1: The Target System (and Components): (Definition) The logical system of interest, which results from, or is subject to, innovation.

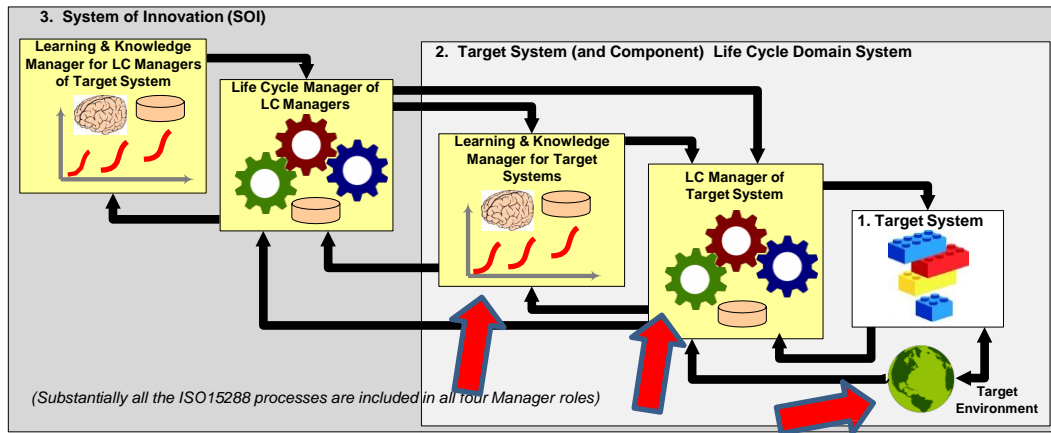
- Its behavior, characteristics, or performance are targets of the innovation (change, adaptation) process we'll introduce later.
- It is potentially agile. (Assertion: for SE to be fully agile, so must its target)
- Examples potentially include aircraft, automobiles, satellites, the human population, software, restaurants.



The Agile System Domain Model

The System 2 model recognizes three systems besides the Target System:

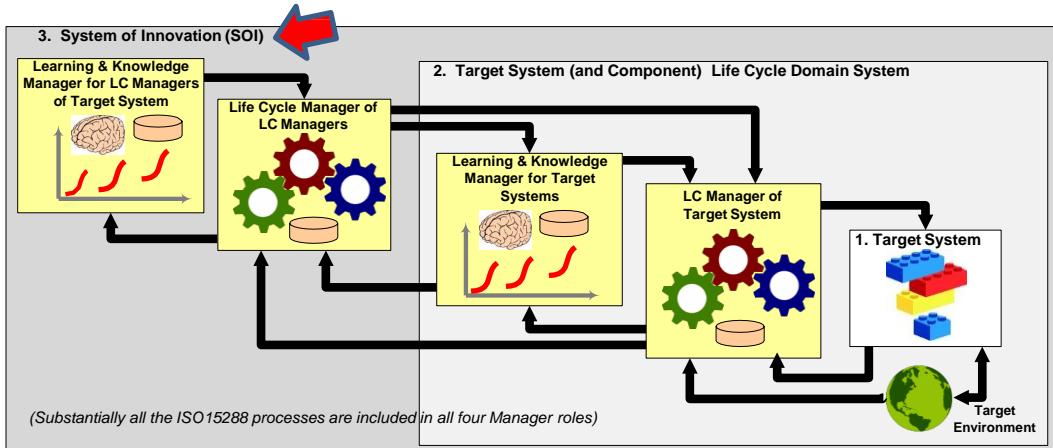
- Target Environment: Target System Life Cycle Domain Actors
- LC Manager of Target System (also manages Target System Components)
- Learning & Knowledge Managers for Target System (and Components)



The Agile System Domain Model

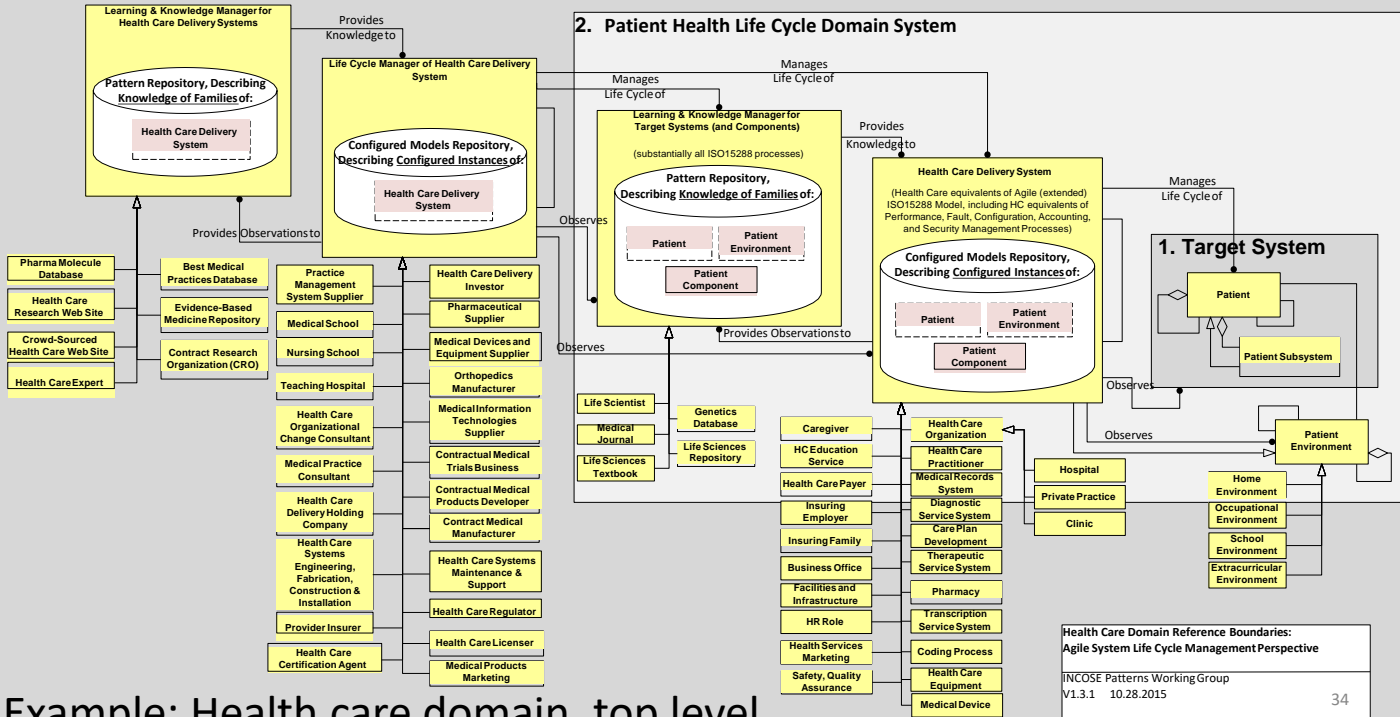
The System 3 model recognizes two sub-systems of System 3:

- Life Cycle Manager of LC Managers
- Learning & Knowledge Managers for LC Managers of Target Systems



Example: Applying the ASELCM Pattern to Plan Agility Improvement in Health Care Systems

3. Health Care System of Innovation (SOI)



Example: Health care domain, top level

Security Engineering

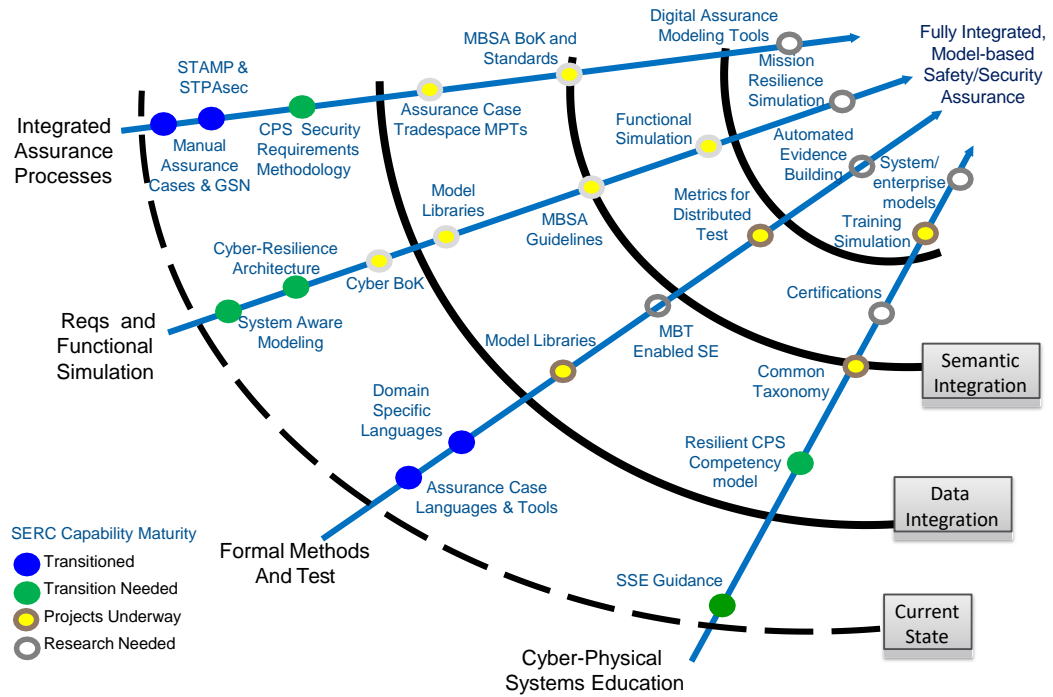


SERC Research Roadmap Development Model-Based Systems Assurance

INCOSE Systems Security Engineering Working Group
July 2019

This material is based upon work supported, in whole or in part, by the U.S. Department of Defense through the Systems Engineering Research Center (SERC) under Contract H98230-08-D-0171. The SERC is a federally funded University Affiliated Research Center (UARC) managed by Stevens Institute of Technology consisting of a collaborative network of over 20 universities. More information is available at www.SERCuarc.org

Model-Based System Assurance (MBSA) Research Roadmap



Key MBSA Research Goals



- Integration of functional methods with formal methods
 - Am I building the right thing? <-> Did I build it right?
 - Help to evolve/transition DARPA Cyber Assured Systems Engineering work
- Evolve Assurance standards and Body of Knowledge for “subversion” behaviors in CPS
- Demonstrate useful quantification (cost/risk) tradespace tools
- Standardize patterns and model libraries for CPS/Threats
- Employ AI/ML methods and tools to automate functional simulation and certification evidence of security in CPS
- Transition to fully integrated, model-based, safety/security practices and toolsets

International Council On Systems Engineering (INCOSE) Automotive Working Group

Chairpersons:

Alain Dauron - Renault

Gary Rushton – General Motors

<https://connect.incose.org/WorkingGroups/Automotive/Pages/Home.aspx>

<https://www.incose.org/incose-member-resources/working-groups/Application/automotive>

Connected Vehicle Reference Implementation Architecture (CVRIA)

- Framework for integration and standardization of connected vehicle technologies
- Basis for a common language definition and early deployment concepts for connected vehicles
- Systems Engineering Tool for Intelligent Transportation (SET-IT)
- Singular architecture composed of four viewpoints, each providing a different perspective
 - **Enterprise:** Relationships between organizations and the role that each organization plays
 - **Functional:** Abstract functional elements (processes) and their logical interactions (data flows)
 - **Physical:** Physical objects, application objects, and high-level interfaces
 - **Communications:** Protocols for communications among physical objects that participate in the connected vehicle environment.

<https://local.iteris.com/cvria/index.html>

Tool interactions/interfaces (model-based collaboration)

- Explore best practices for passing SysML models up and down the supply chain
- Working demonstration of models for two chips being passed to a hypothetical electronic control unit (ECU) supplier who then integrates them and runs a live simulation of the system behavior.
- Ongoing project with call for participation

Contact David Hetherington, Principal Engineer Functional Safety and Software at Encore Semi:

david.hetherington@ieee.org



29th Annual **INCOSE**
international symposium

Orlando, FL, USA
July 20 - 25, 2019

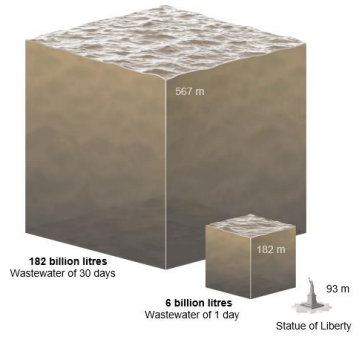
IS 2019 Practitioners Challenge: Clean Water





The race to save the river Ganges

Worshipped by a billion Hindus and a water source for million, the government is battling to save "Mother Ganga"

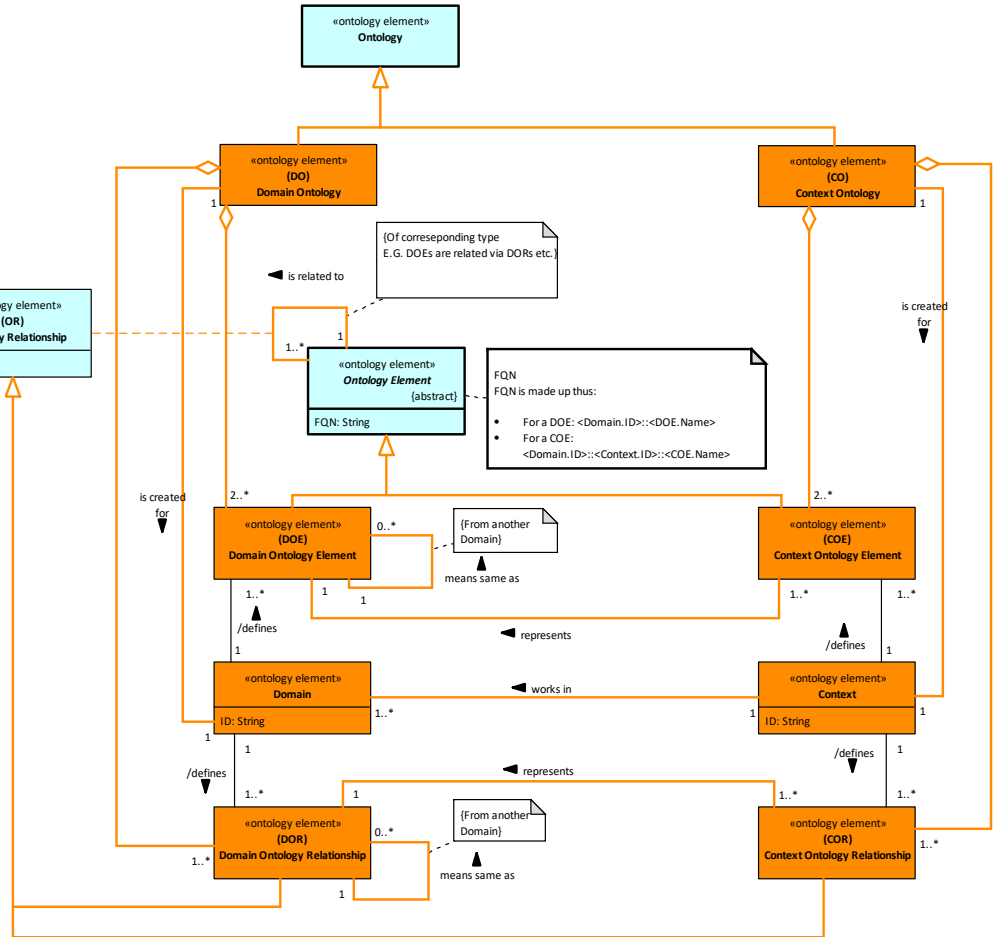
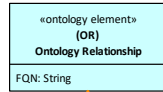


<p>6 CLEAN WATER AND SANITATION</p> <p>SUSTAINABLE DEVELOPMENT GOALS</p> <p>ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL</p>	<p>18% NEARLY OF WORLD'S POPULATION</p>	<p>330 MILLION NEARLY PEOPLE ARE EXPECTED BY 2030 TO BE LACKING IN INDIA</p>
	<p>4% OF AVERAGE RURAL RAINFALL IN RIVERS</p>	<p>OVER 50% RURAL HOUSEHOLDS DO NOT HAVE ACCESS TO OPEN</p>
<p>2.6 BILLION PEOPLE HAVE GAINED ACCESS TO IMPROVED DRINKING WATER SOURCES SINCE 1990</p> <p>663 MILLION PEOPLE ARE STILL WITHOUT</p>	<p>0.4 MILLION SCHOOLS WITH IMPROVED TOILET FACILITIES FOR GIRLS (2006-2006)</p> <p>1.24 MILLION (2013-2013)</p>	<p>0.9 MILLION NUMBER OF SCHOOLS WITH IMPROVED DRINKING WATER INCREASED (2006-2006)</p> <p>1.36 MILLION (2013-2013)</p>
<p>EACH YEAR NEARLY 200,000 CHILDREN DIE DUE TO SEVERE DIARRHEA</p>		

How can the organisations responsible for a connected vehicle ensure that it remains secure throughout its lifecycle?

Namespace FAF extension

ASEC 2019 paper
"What's in a Name"



Questions

Stephen Powley MEng MIET MINCOSE
Research Centre Future Transport and Cities
powleys@uni.coventry.ac.uk

coventry.ac.uk/research/areas-of-research/institute-for-future-transport-and-cities/our-research/systems/