



## ASSESS Notes from the Front-- Community Universal Reference Patterns

- S\*Wrapper: Model Characterization Pattern
- S\*Trust: Trusted Model Repository Pattern
- S\*Eco: Virtual Ecosystem Pattern

# Responsible collaborating community organizations

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**International Council on Systems Engineering (INCOSE)**--Model-Based Patterns Working Group:

- Model-based Patterns formalizing knowledge across diverse domains.

**ASME Model V&V 50 Subcommittee**--Model Life Cycle Working Group:

- Model VVUQ guidelines and standards authoring for establishing and maintaining computational model credibility across life cycles.

**V4 Institute** (V4I)—a member collaboration program under NCDMM:

- Growing related virtual model capabilities across industry communities of practice.

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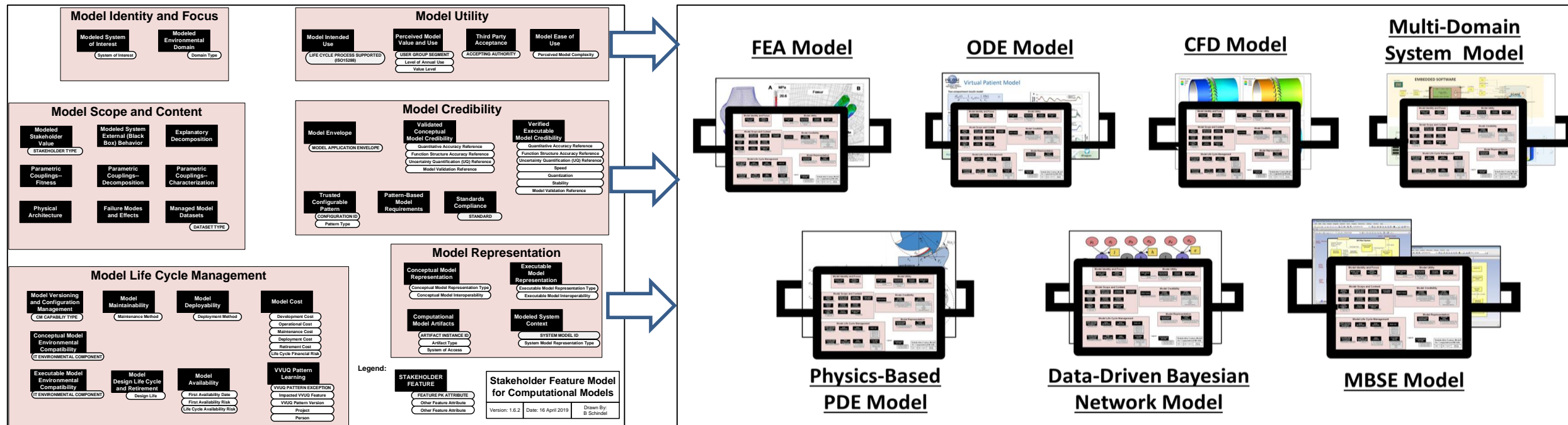
# Virtual model community reference patterns

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- **S\*Wrapper**: Model Characterization Pattern (describes models)
  - Universal model metadata wrapper for all virtual model types
  - Computational models, system models, others
- **S\*Trust**: Trusted Model Repository Pattern (describes repositories)
  - Reference pattern for all trusted repositories of trusted virtual models
  - Federated authoring, execution, application, life cycle management
- **S\*Eco**: Virtual Ecosystem Pattern (describes ecosystems)
  - Reference pattern for all life cycle management ecosystem types
  - Processes, models, patterns, datasets, tooling, federations

# S\*Wrapper: Model Characterization Pattern (describes models)

- Helps manage the model's entire life cycle: planning model stakeholder features, development, VVUQ, exchange, catalog, maintenance;
- Generation of model technical requirements from model features.



## Model Identity and Focus

Modeled System of Interest

System of Interest

Modeled Environmental Domain

Domain Type

## Model Utility

Model Intended Use

LIFE CYCLE PROCESS SUPPORTED (ISO15288)

Perceived Model Value and Use

USER GROUP SEGMENT  
Level of Annual Use  
Value Level

Third Party Acceptance

ACCEPTING AUTHORITY

Model Ease of Use

Perceived Model Complexity

**S\*Wrapper: Configurable MCP Feature Groups for Models (Computational Model's Stakeholder Requirements)**

## Model Scope and Content

Modeled Stakeholder Value

STAKEHOLDER TYPE

Modeled System External (Black Box) Behavior

Explanatory Decomposition

Parametric Couplings-- Fitness

Parametric Couplings-- Decomposition

Parametric Couplings-- Characterization

Physical Architecture

Failure Modes and Effects

Managed Model Datasets

DATASET TYPE

## Model Credibility

Model Envelope

MODEL APPLICATION ENVELOPE

Validated Conceptual Model Credibility

Quantitative Accuracy Reference  
Function Structure Accuracy Reference  
Uncertainty Quantification (UQ) Reference  
Model Validation Reference

Verified Executable Model Credibility

Quantitative Accuracy Reference  
Function Structure Accuracy Reference  
Uncertainty Quantification (UQ) Reference  
Speed  
Quantization  
Stability  
Model Validation Reference

Trusted Configurable Pattern

CONFIGURATION ID  
Pattern Type

Pattern-Based Model Requirements

Standards Compliance

STANDARD

(See References for details and definitions.)

## Model Life Cycle Management

Model Versioning and Configuration Management

CM CAPABILITY TYPE

Model Maintainability

Maintenance Method

Model Deployability

Deployment Method

Model Cost

Development Cost  
Operational Cost  
Maintenance Cost  
Deployment Cost  
Retirement Cost  
Life Cycle Financial Risk

VVUQ Pattern Learning

VVUQ PATTERN EXCEPTION  
Impacted VVUQ Feature  
VVUQ Pattern Version  
Project  
Person

Conceptual Model Environmental Compatibility

IT ENVIRONMENTAL COMPONENT

Executable Model Environmental Compatibility

IT ENVIRONMENTAL COMPONENT

Model Design Life Cycle and Retirement

Design Life

Model Availability

First Availability Date  
First Availability Risk  
Life Cycle Availability Risk

## Model Representation

Conceptual Model Representation

Conceptual Model Representation Type  
Conceptual Model Interoperability

Executable Model Representation

Executable Model Representation Type  
Executable Model Interoperability

Computational Model Artifacts

ARTIFACT INSTANCE ID  
Artifact Type  
System of Access

Modeled System Context

SYSTEM MODEL ID  
System Model Representation Type

Legend:

STAKEHOLDER FEATURE

FEATURE PK ATTRIBUTE  
Other Feature Attribute  
Other Feature Attribute

Stakeholder Feature Model for Computational Models

Version: 1.6.2

Date: 16 April 2019

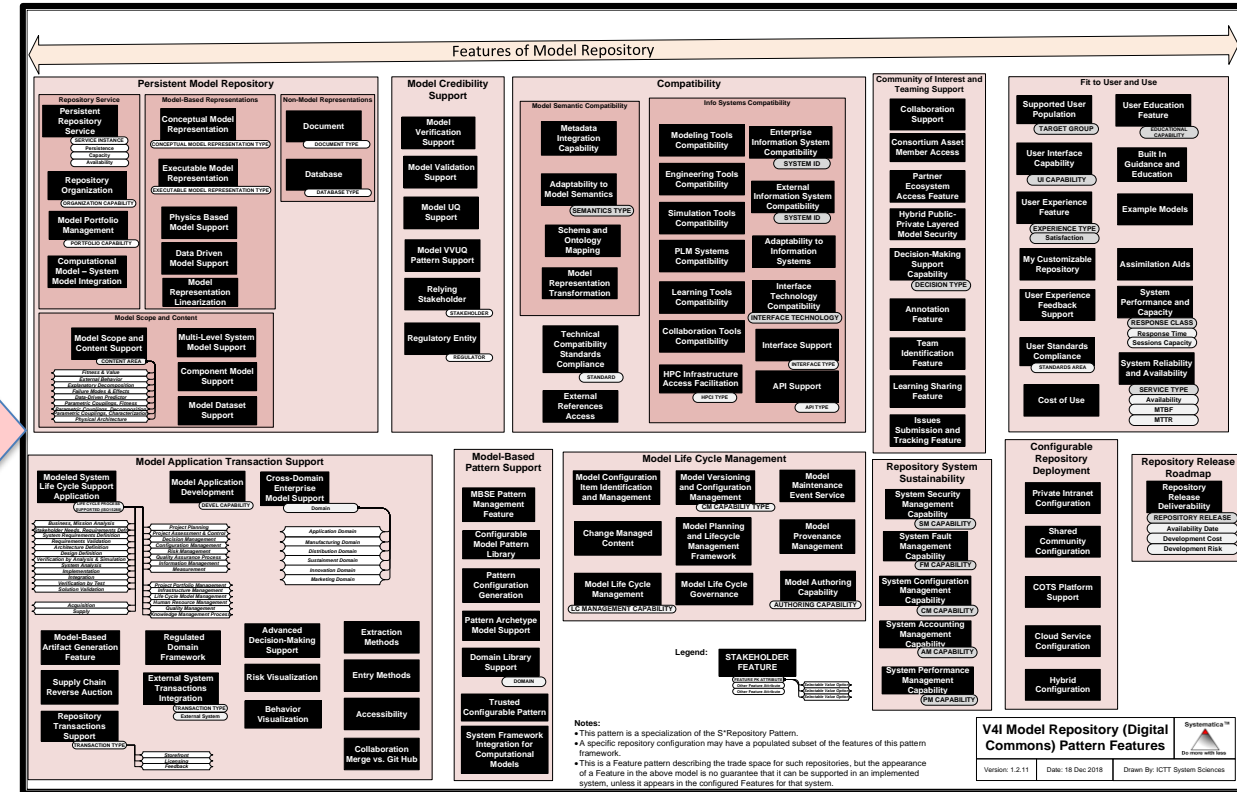
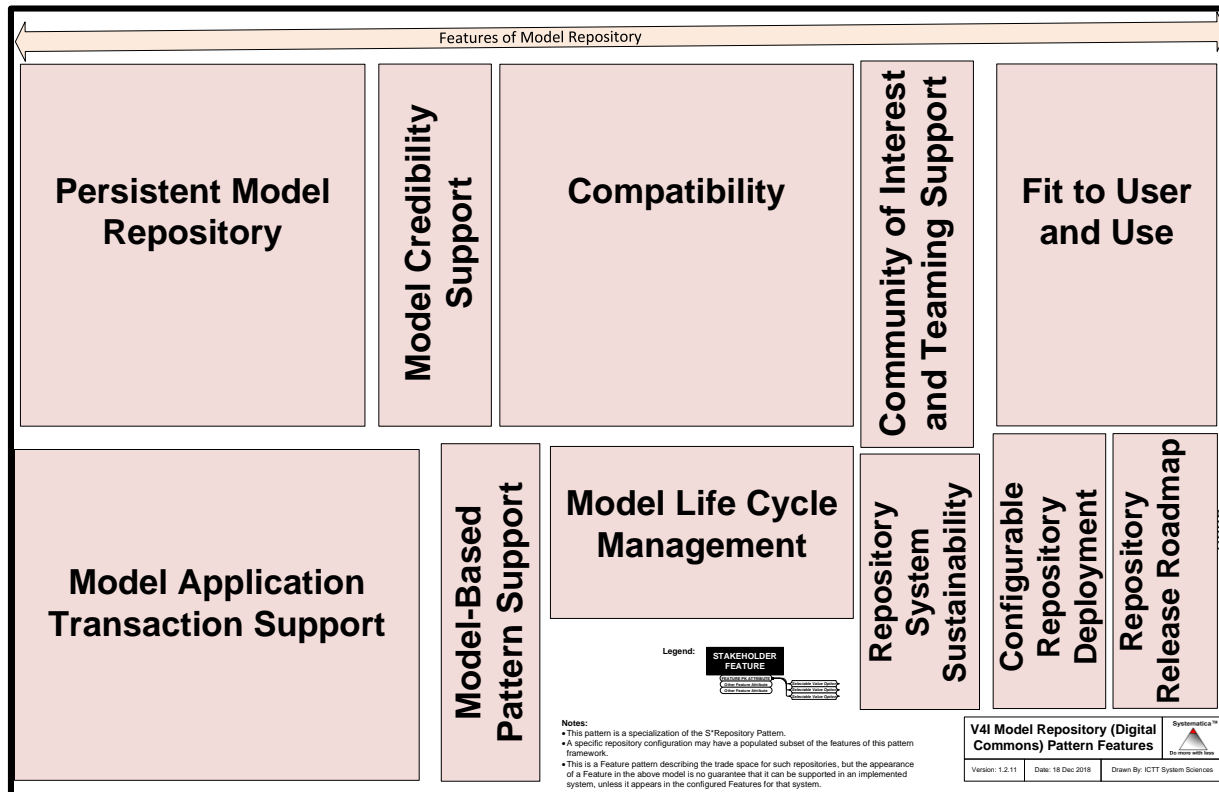
Drawn By: B Schindel

Model Utility							
Feature Container	Feature Superclass	Feature Name	Config/Ref for Population	Feature Definition	Feature Attribute	PK	Attribute Definition
Model Utility	Model Ease of Use	Model Ease of Use		The perceived ease with which the model can be used, as experienced by its intended users.	Perceived Model Complexity		High, Medium, Low
Model Utility	Model Intended Use	Model Intended Use		The intended purposes or uses of the model.	Life Cycle Process Supported	X	The intended life cycle management processes to be supported by the model, from the ISO15288 processes list. More than one value may be listed.
Model Utility	Perceived Model Value and Use	Perceived Model Value and Use		The relative level of value accrued to the model, by those who use it for its stated purpose.	User Group Segment	X	The identity of using group segment, including:
Model Utility	Perceived Model Value and Use	Perceived Model Value and Use		The relative level of value accrued to the model, by those who use it for its stated purpose.	Level of Annual Use		The relative level of annual use by the segment.
Model Utility	Perceived Model Value and Use	Perceived Model Value and Use		The relative level of value accrued to the model, by those who use it for its stated purpose.	Value Level		The value class associated with the model, by the segment.
Model Utility	Third Party Acceptance	Third Party Acceptance		The degree to which the model is accepted as authoritative, by third party regulators, customers, supply chains, and other entities, for its stated purpose.	Accepting Authority	X	The identity (may be multiple) of regulators, agencies, customers, supply chains, accepting the model, for its stated purpose.

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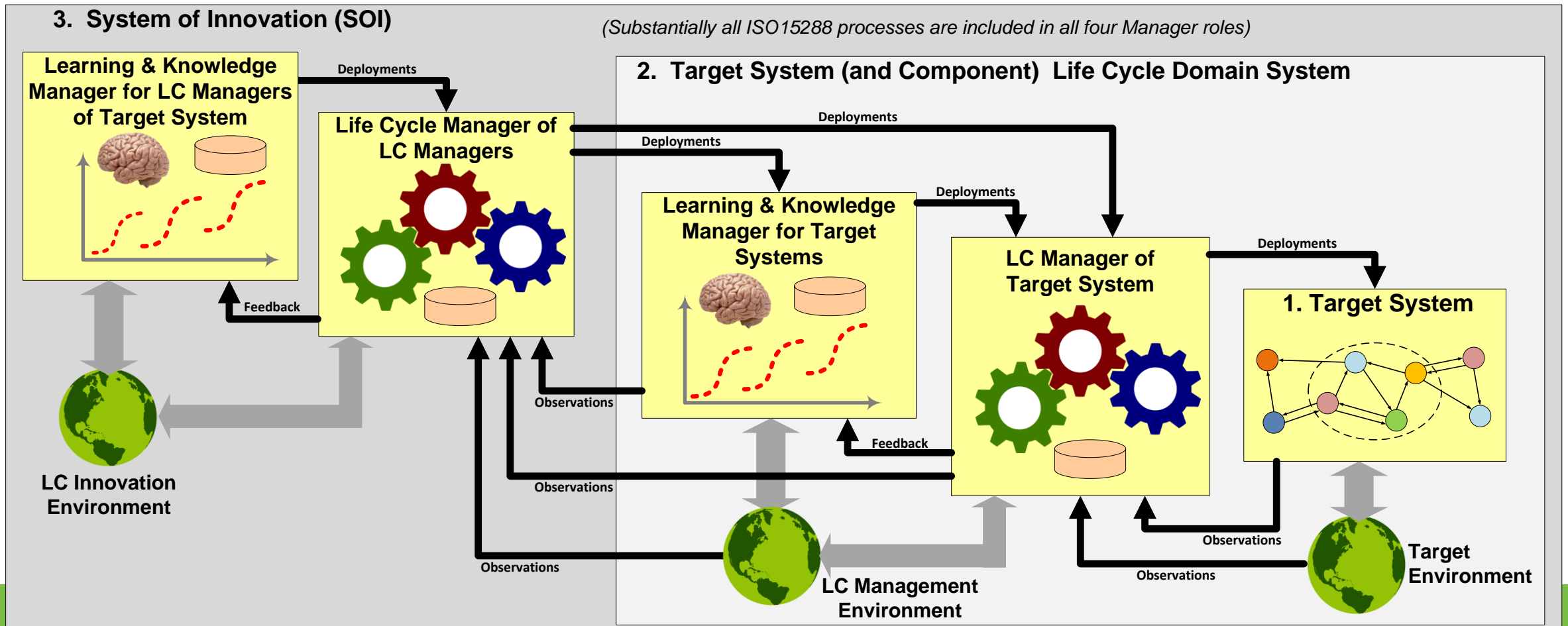
# S\*Trust: Trusted Model Repository Pattern (describes repositories)

- Neutral configurable pattern for planning, describing, trusting federated toolchains and repositories of trusted models of all types.
- Beginning with configurable generic stakeholder feature pattern.



# S\*Eco: Universal Virtual Ecosystem Pattern (describes ecosystems)

- System 1: Target system of interest, being engineered, managed, operated;
- System 2: System of life cycle management of System 1—engineering, et al;
- System 3: System of advancing & managing System 2 life cycle (OCM, etc.).



# How to get involved

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- INCOSE Patterns Working Group:  
<https://www.omgwiki.org/MBSE/doku.php?id=mbse:patterns:patterns>
- ASME VV50 Model Life Cycle Working Group:  
<https://cstools.asme.org/csconnect/CommitteePages.cfm?Committee=101978604>
- Virtual Verification, Validation, and Visualization Institute (V4I):  
<http://v4i.us/>
- Contact: Bill Schindel  
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# Discussion, questions

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# References

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2. “Introduction to the Agile Systems Engineering Life Cycle MBSE Pattern”, *Proc of INCOSE 2016 International Symposium*, July, 2016:  
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3. “The Model Characterization Pattern (MCP): A Universal Characterization & Labeling S\*Pattern for All Computational Models”, V1.8.1:  
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4. INCOSE MBSE Patterns Working Group, “MBSE Methodology Summary: Pattern-Based Systems Engineering (PBSE), Based On S\*MBSE Models”, V1.5.5A:  
<http://www.omgwiki.org/MBSE/doku.php?id=mbse:pbse>



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CONGRESS

