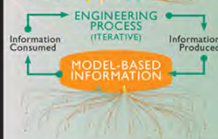


# A MODEL-BASED ENGINEERING (MBE) MANIFESTO

PURPOSE: *To motivate the transformation to Model-Based Engineering.*

Faced with increasing system complexity, interdependencies, breakdown of document-based methods, and other challenges, MBE provides the transformation in which **we value**:



- 1 Information over artifacts
- 2 Integration over independence
- 3 Expressiveness with rigor over flexibility
- 4 Model usage over model creation

We value the items on the right, but not at the sacrifice of the items on the left.

## WITH THESE PRINCIPLES:

On behalf of stakeholders, MBE increases emphasis on **describing** the nature and content of the **information** produced and consumed, compared to the traditional emphasis on engineering process and procedure.

We recognize that—**independent** of specific Information format, structure, language, syntax, the sequence or order of its production and consumption, and the domains and environments of our projects—the underlying nature (**semantics**) of the **essential** information we seek to discover and produce is **invariant** because of the very nature of engineering.

An essential and dynamically changing property of model information is its **credibility** to those people and processes which will **consume** that information. The critical nature of some **intended uses** of model information sets a higher bar on required investment in model **verification, validation** and **uncertainty quantification**.

Principles of **human-machine interaction** applied to the targeted stakeholders are vital to success. Application of advanced visualization methods **and augmented intelligence** capabilities can advance that success.

We seek an extended team across engineering disciplines with **common and integrated understanding** of the identity and nature of the model information as well as its content.

We seek effective **enterprise-wide reuse** of model-based information to more fully leverage past individual or local learning.

Systems engineering performed according to the above principles is required for the Engineering System itself, a complex and evolving system.

## THE TEAM:

The team was assembled by invitation, intentionally drawing together different perspectives.

- Canada National Laboratories
- Ed Carroll  
Team lead-Sandia National Laboratories - Engineering Methods Research
- Nancy Hayden  
SNL - Autonomous Systems/ Engineering Policy
- Sharon Trauth  
SNL - Systems Engineering/ MBE Practice
- Dana Grisham  
SNL - Data Governance/Agile Methods
- Chris Schreiber  
Lockheed Martin Space Systems-Systems Engineering Modernization
- Bill Schindel  
KITT-Systems Sciences-Systems Sciences
- ENGILITY
- Frank Salvatore  
Engility Corp-Systems Engineering/ Data Taxonomy
- UNIVERSITY OF ALBANY
- Eliot Rich  
Univ at Albany, SUNY-System Dynamics
- Teleconference participation from:
  - Jan Propulsion Laboratory
  - Steve Jenkins  
JPL-Systems Semantics
  - ADG
  - Anne O'Neil  
Anne O'Neil Consultants-Organizational Transformation

**A MODEL-BASED ENGINEERING (MBE) MANIFESTO**

THE INTERNATIONAL FEDERATION FOR SYSTEM RESEARCH (IFSR) CONVERSATION

**TOPICS AND TEAM LEADERS AT THE 2018 IFSR CONVERSATION:**  
The International Federation for System Research sponsored the Nineteenth IFSR Conversation, this year in Linz, Austria. Conversation topics and team leaders included:

- Systems Approach for Active and Healthy Aging - Gerhard Christler and Steinar Sankers
- What is Systems Science? - Gary Zornik and Jennifer Heiler
- Systems Practice - Ivan Nguyen and Consuelo Abalo
- Data Driven Systems Engineering Approaches - Ed Carroll

**CONVERSATION APPROACH:**  
Conversations were facilitated by Ed Carroll, biweekly around 1980 on an alternative to the classical conferences, in a IFSR Conversation a small group of scientists meets for several days to discuss in a self-guided way, a topic of scientific and social importance.

No papers are presented. The participants discuss their topic face-to-face. The Conversation typically accommodates approximately 20 people, divided into a maximum of 5 teams.

While participants are open to individual or smaller group presentations and others interested in the topics of the Conversation, the final selection of participants is only by invitation of the IFSR according to the prospective participant's ability to contribute to the outcomes.

Participants are expected to attend the whole Conversation. Each team meets for 8 days to develop conceptual models and identify their understanding of the main topic and to interact with other teams.

At the conclusion, each team presents its findings to the entire group. After the Conversation, the teams document their findings through a team report and possibly further papers, including the proceedings of the Conversation.

## LET'S HAVE A CONVERSATION ON THE MBE MANIFESTO

(IFSR; LINZ, AUSTRIA; APRIL 2018)

- TO MOTIVATE THE TRANSFORMATION TO MODEL-BASED ENGINEERING:
  - WHY DO YOU NOT SHARE THESE VALUES?
  - WHY CAN YOU NOT FOLLOW THESE PRINCIPLES?
  - SHARE YOUR THOUGHTS
  - ARGUE YOUR POINT

**A MODEL-BASED ENGINEERING (MBE) MANIFESTO**

IN THE MONTHS PRIOR TO THE CONVERSATION THE TEAM COLLABORATED EXTENSIVELY ON THE AGENDA

Our concern was to ensure that we had a well-organized agenda that would produce worthwhile, engaging and conclusive conversations. The resulting starting agenda was far too ambitious for some available. However, we had agreed before coming together that the agenda would be ours to maintain and adjust as the week progressed.

The final agenda that emerged encouraged conversation flowing through the Systems of Innovation paradigm, starting with the system model of the target system (S1), working upward toward the model of the system domain system - the system that manages the target system model (S2), and then on to the model of system of innovation - the system that evolves the life cycle domain system (S3).