Applied Model-based Systems Engineering

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Course Description

This 3 to 4 day tailorable course provides a broad introduction to the what, why and how of the processes, practices, tools and techniques that comprise the emerging discipline of model-based systems engineering (MBSE). The course makes extensive use of "learn by doing" through hands-on exercises. The focus is on six central themes that comprise the unique advantages MBSE offers – Capturing, Connecting, Controlling, Communicating, Collaborating and Cycling. The current state of modelling languages (UML, SYSML, LML, and others), ontologies, architectural frameworks and tools are examined.

From this foundation, the course then focuses on examining each key part of systems engineering-- Design, Manage, and Realize. Participants are guided through how to build a system model "from scratch" leveraging design patterns and other techniques. A "graduation exercise" asks participants to build their own model for a system of their choice.

Course Materials

Each participant will receive:

- A complete electronic set of course notes with copies of the slides used in the presentation
- An e-copy of the Applied Space Systems Engineering textbook

Course Topics

Foundations

- Introduction to Systems Engineering using Models
- Innoslate Quick Start Guide
- Ontologies, Languages and Frameworks
- Solar Fan Exercise

MBSE Applications

- Design
- Manage
- Realise

MBSE Creation

- Introduction to MBSE Simulations
- Design Patterns and Model Re-use
- Software Modelling
- Project and Configuration Management
- Digital Threads and Digital Twins
- Tool Selection Exercise
- Building Your Own Model
- Model Building "Graduation" Exercise

Who Should Attend

This course is intended for practicing systems engineers, payload principle investigators, subsystem engineers or project managers involved in any phase of the space mission life cycle who are curious about application of MBSE to their projects.

Course Objectives

By the end of this course participants will be able to:

- Define Model-based Systems Engineering and discuss its value proposition across the project life cycle
- Recognize and explain the use of SysML as well as other commonly used systems engineering diagrams and artifacts
- Given existing system details, apply MBSE tools and techniques to build a basic system model that captures and communicates the design solution as well as key relationships.
- Use a system model to simulate system behaviour
- Participate in a simulated model-based Design Review to explore the application of MBSE to evaluate project technical maturity.
- Using MBSE, examine details about a system's structure and behaviour to identify potential issues (i.e. gaps, omissions, overlaps, missing traceability, cause and effect, etc.) and propose fixes or improvements to the model
- Model specific systems engineering artifacts such as requirements, functional architectures, and interface architectures using diagrams and other techniques across the Design, Manage and Realize life cycle
- Build your own integrated model

Software tools

- Innoslate cloud-based tool (free trial license). Internet access required.
- Cameo Enterprise Architect also available (Customer needs to provide own licenses)

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