ENOLA

MBSE with MathWorks System Composer

October 2024

About US

LEAVE THE PAST IN THE PAST

IT'S TIME TO EVOLVE, DIGITALLY

WE ARE A TRAINING, COACHING, AND CONSULTING FIRM DEDICATED TO THE RAPID EVOLUTION OF OUR CLIENTS WITHIN THE DIGITAL UNIVERSE. OUR SERVICES ARE DIRECTED TOWARDS:

- DIGITAL ENGINEERING/TRANSFORMATION
- MODEL BASED SYSTEMS ENGINEERING
- ENTERPRISE ARCHITECTURE
- SOFTWARE ARCHITECTURE
- DATABASE ARCHITECTURE
- ONTOLOGIES
- COLLABORATION SERVER MANAGEMENT

MISSION

Enola WILL train, coach, and mentor your staff to be independently successful as quickly as possible.

Yes, our mission is to work ourselves out of a job!

Course Description

MBSE with System Composer is a three-day course dedicated to training staff in the definition of system architecture in MathWorks System Composer.

This course provides a mix of slides, instructor led demonstrations, and a lab in which students architect an example system. Our trainers are all experienced practitioners who understand the delicate balance of theory and practicality.

Prerequisites:

Foundation in basic systems engineering

Required Software:

MATLAB 2024a+ installation with System Composer, Requirements Toolkit, Simulink, Stateflow, and Variant Manager

Take-Aways:

- Ability to understand and model requirements, structure, and behavior in System Composer
- Exposure to simulating and analyzing System Composer models with MATLAB, Simulink, and Stateflow

AGENDA

DAY 1:
INTRO, PROJECTS, REQUIREMENTS, & CONCEPT MODEL

- Training Overview
- Introduction to MBSE & System Composer
- Model Organization in a Project + Lab
- Requirements
- Concept Model + Lab

DAY 2:
LOGICAL MODEL

- Logical Architecture + Lab
- Logical Behavior + Lab

DAY 3:
PHYSICAL MODEL & ANALYSIS

- Physical Models & System Analysis + Lab
- Training Review

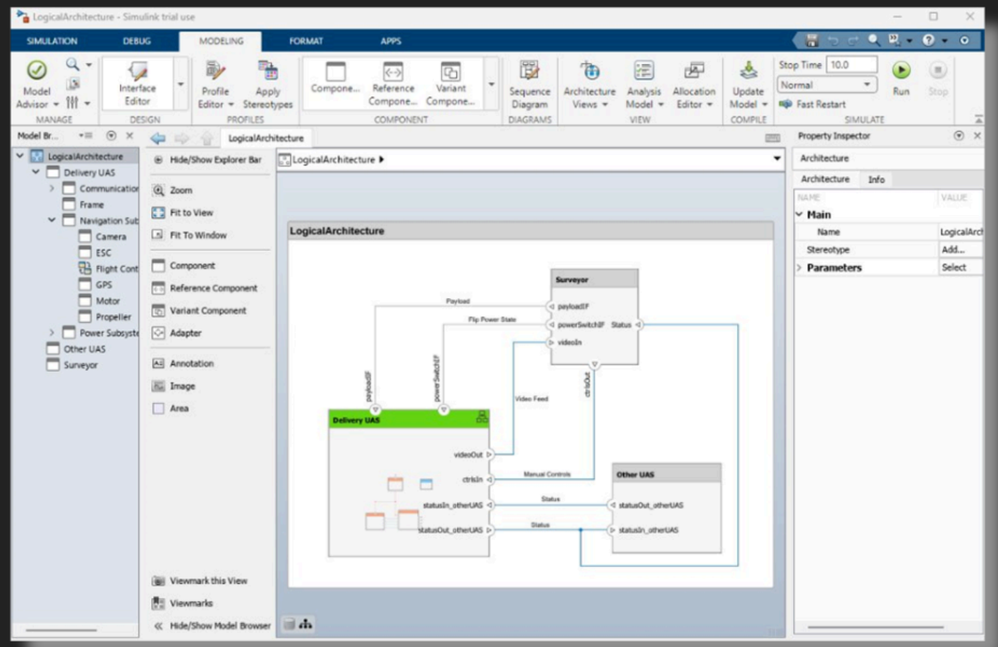
COURSE CONTENT

Introduction to MBSE & System Composer

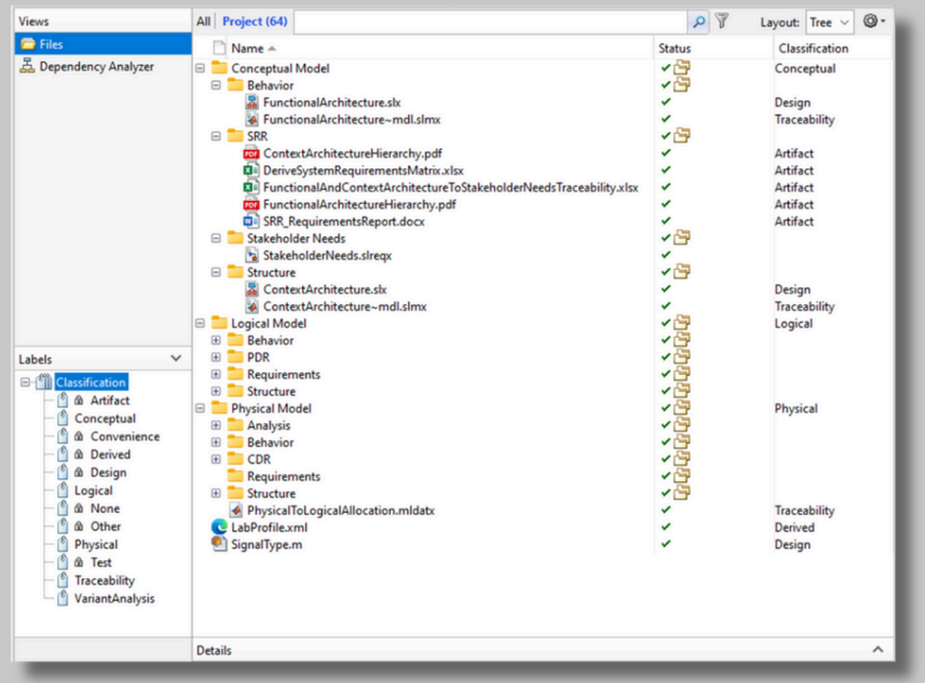
MBSE is a paradigm shift from a document-centric approach to system definition in a single repository.

This module covers:

- MBSE
  - Definitions
  - Advantages
- Introduction to System Composer



Model Organization IN A PROJECT



Projects, folders, models, and labels enable users to create a structured database that provides navigability and data grouping.

This module covers:

- Defining a Project in MATLAB
- Organization of data with folders and labels
- Using the Dependency Analyzer

Requirements

Requirements are text-based specifications that constrain the system architecture.

This module covers:

- Requirements, their properties, and abstraction levels
- Links between requirements and from model elements to requirements
- Customization of requirements
- Alternate views for requirement traceability (Traceability Matrix, Traceability Diagram)
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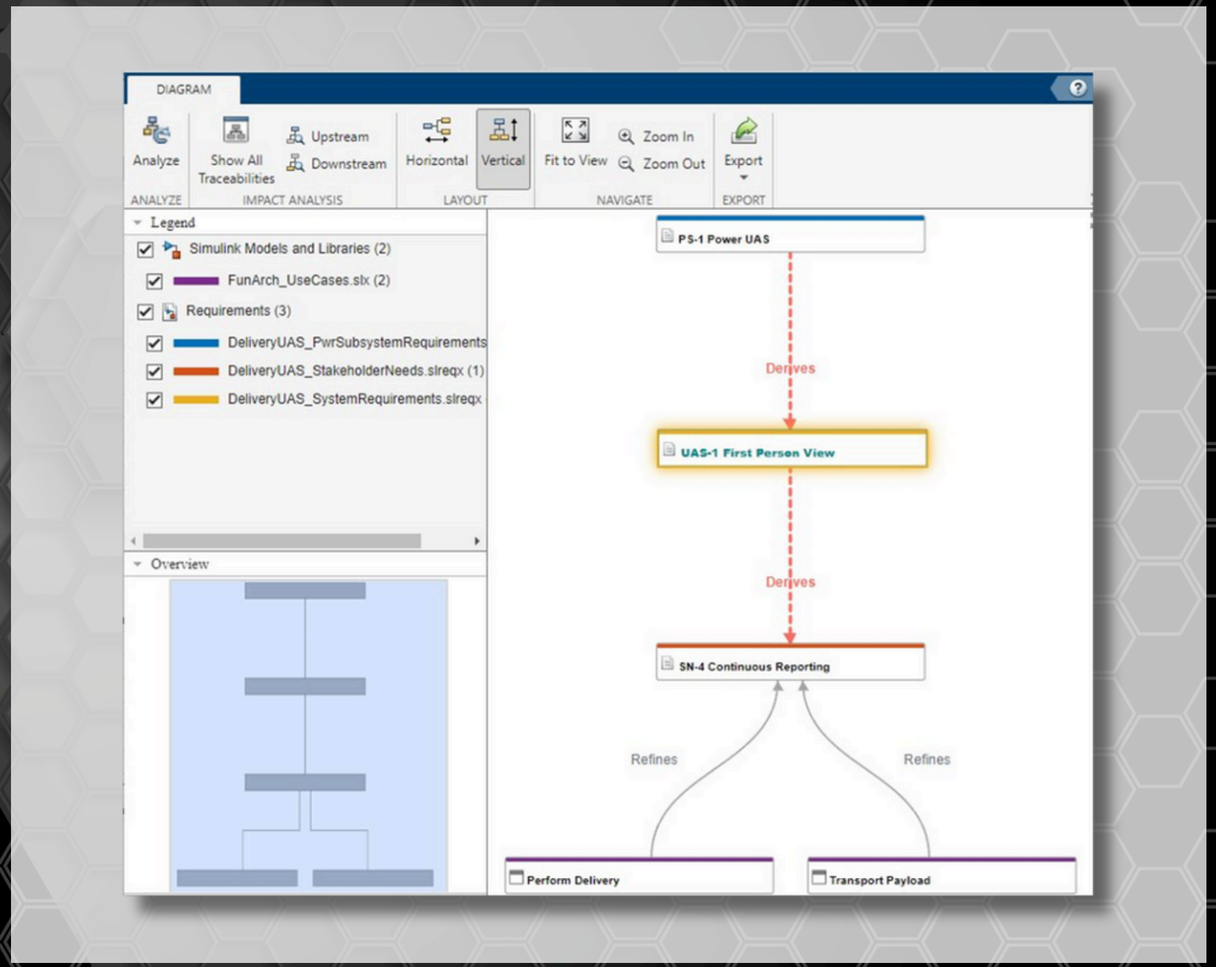
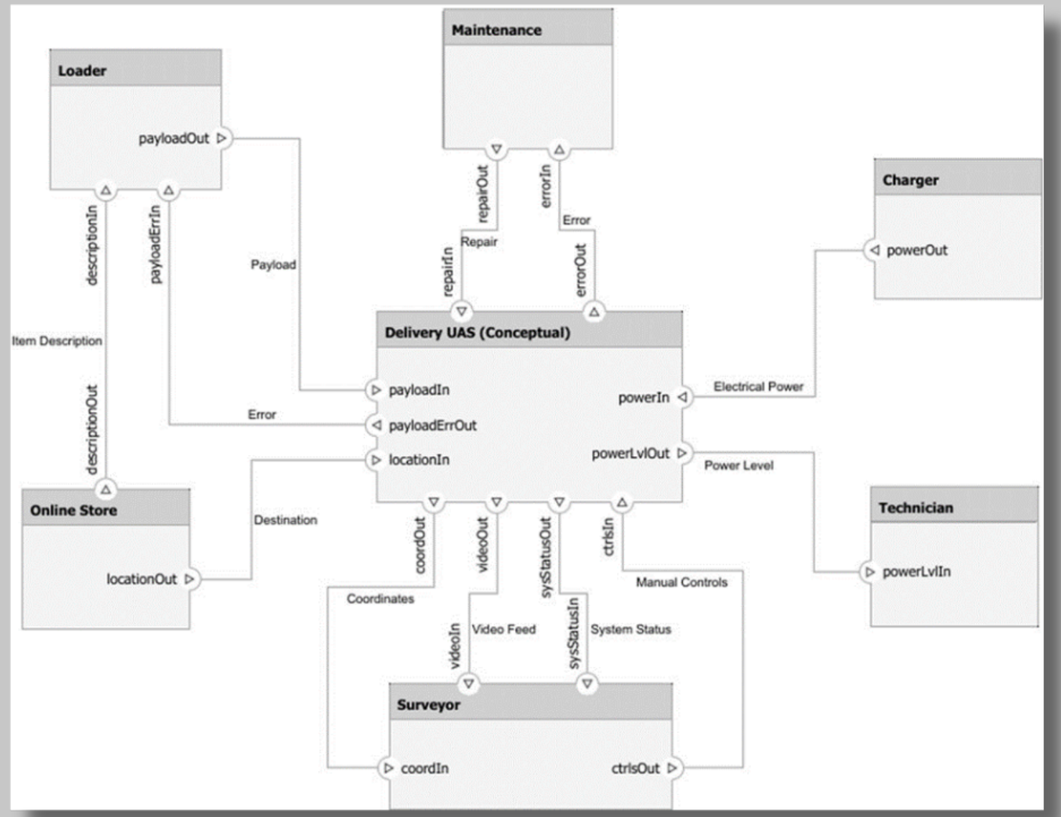


Concept Model

The concept model is a black-box view of the system that defines what behavior is performed and what matter, data, or energy flows in and out of the system.

This Module Covers:

- Scope for abstraction for modeling systems
- Stakeholder needs
- Context & Functional Architectures
- Introduction to Interface Definition

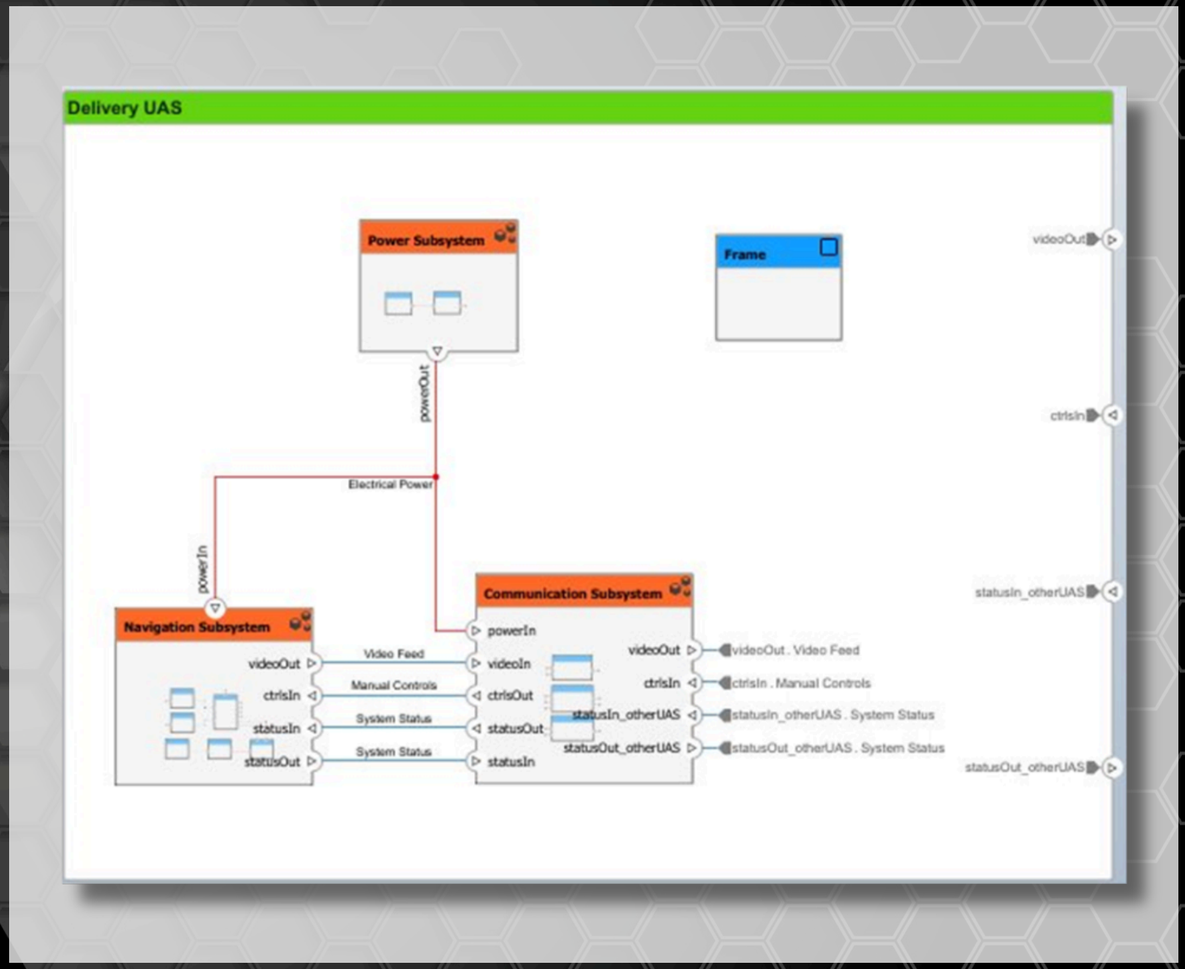


Logical STRUCTURE

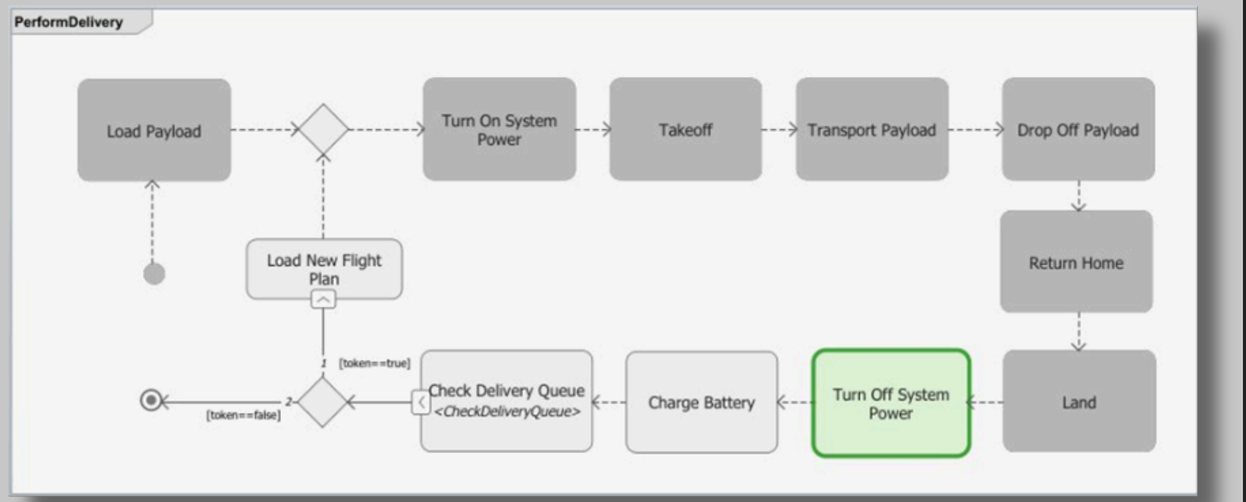
The logical structure defines the system hierarchy, interfaces, and data flow that serves as a template from which physical variants are derived.

Within this module we cover:

- Structural decomposition
- Component definition, parameters, and customization
- Interface definition
- Stereotypes & best practices



System BEHAVIOR



In System Composer, behavior can be described with Activity Diagrams. Sequence Diagrams, Stateflow Charts, and Simulink models.

Within this module we cover:

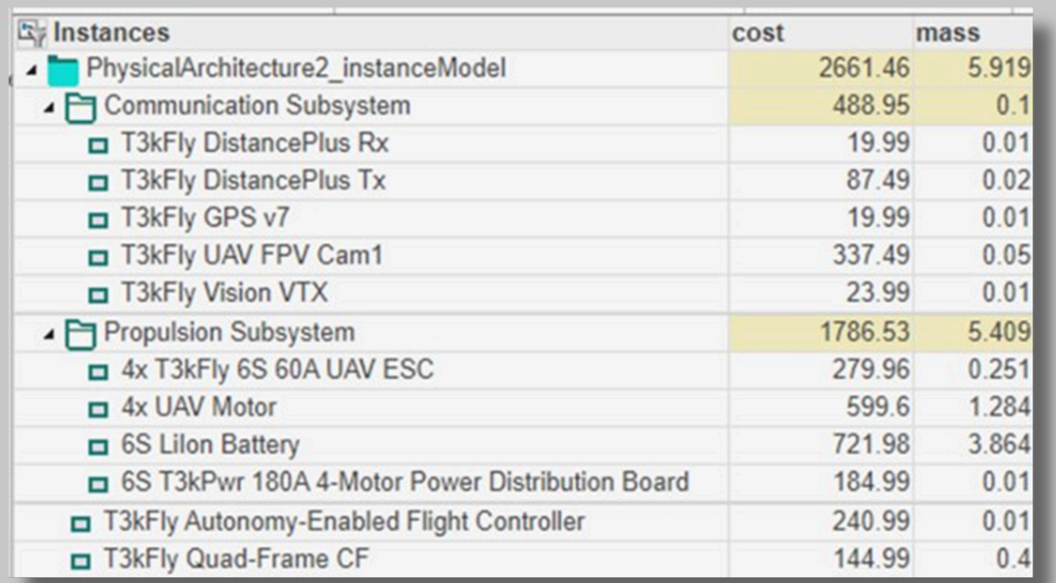
- The definition, elements and GUI for each behavior type
- Behavior allocation & requirements traceability
- Using MATLAB scripts with system behavior

Physical Models & SYSTEM ANALYSIS

The physical model defines the actual parts, interfaces, data flow, and value specifications that could be used in an implementation of the system.

Within this module we cover:

- Physical ports & interfaces
- Reference and variant components
- Using Simulink to define physical behavior
- Analysis models & instances



Instances	cost	mass
PhysicalArchitecture2_instanceModel	2661.46	5.919
Communication Subsystem	488.95	0.1
T3kFly DistancePlus Rx	19.99	0.01
T3kFly DistancePlus Tx	87.49	0.02
T3kFly GPS v7	19.99	0.01
T3kFly UAV FPV Cam1	337.49	0.05
T3kFly Vision VTX	23.99	0.01
Propulsion Subsystem	1786.53	5.409
4x T3kFly 6S 60A UAV ESC	279.96	0.251
4x UAV Motor	599.6	1.284
6S LiIon Battery	721.98	3.864
6S T3kPwr 180A 4-Motor Power Distribution Board	184.99	0.01
T3kFly Autonomy-Enabled Flight Controller	240.99	0.01
T3kFly Quad-Frame CF	144.99	0.4

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