MATLAB EXPO 2019

Ingegneria dei Sistemi
Dai Requisiti all’Architettura alla Simulazione

Vincenzo Petrella
Key Takeaways

- Digital thread providing traceability between requirements, architecture, and design

[Diagram showing traceability between requirements and implementation]
Key Takeaways

- Digital thread providing traceability between requirements, architecture, and design
- Connected environment for designing and analyzing architectures and designs
Key Takeaways

- Digital thread providing traceability between requirements, architecture, and design

- Connected environment for designing and analyzing architectures and designs

- Integrated platform for analyzing all parts of your architecture in one multi-domain environment
What does that mean?

**Early in the Process**
Concepts/Descriptions

**Later in the Process**
Models
What is the Gap?

Early in the Process
Concepts/Descriptions

Later in the Process
Models

Digital Thread
Connected Environment
Analysis & Simulation Platform
What goes into the bridge?

1. Functional Requirements

1.1. Normal Mode of Operation

During the normal mode of operation, the Fault Tolerant Fuel Control System shall determine the fuel rate which is injected at the valves.

1.1.1. Stoichiometric mixture ratio

During normal model of operation, the System shall maintain the stoichiometric mixture target ratio of 14.6.

1.1.2. Oxygen Sensor (EGO)
MathWorks Solution: System Composer R2019a and

- Be Intuitive
- Facilitate Analysis
- Tackle Complexity
- Enable Implementation

Requirements Coverage Reporting and Impact Analysis

Simulink Requirements
Now let’s see it in action
How to run the Delinavalland model:
1. See the Aerospace Blockset User's Guide for instructions to set up FlightGear.
2. Install the dhc2 geometry model to FlightGear's data/Aircraft directory. The geometry is downloadable from www.flightgear.org.
3. To start FlightGear, open a command prompt and execute the script file.
Gas Engine: Nine-cylinder, air-cooled, radial aircraft engine
Fuel type: 80/87 grade aviation gasoline
Dry weight: 290 kg
Power output: 400 hp (298 kW) at
Propulsion Power Subsystem
< Engine_Power_Nm_s >

Actuator Power Subsystem
< Actuators >
#35: Propulsion Power

**Propulsion Power Subsystem**

- Engine: Nine-cylinder, air-cooled, radial aircraft engine
- Fuel type: 80/87 grade aviation gasoline
- Dry weight/lb (1.03 kW/kg): 290 kg
- Power output: 400 hp (298 kW) at 2,200 RPM up to 5,000 rpm (1,500 rev)
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Simulink Requirements
Digital Thread from Requirements to Architecture and Design

- Author requirements or view from external source
- Identify gaps in architecture or design
- Link requirements, architectures, design, code and test
- Identify impact of requirement changes

MATLAB EXPO 2019
System Composer
Intuitively design system and software architectures

Description
==
Architecture
System Composer
Perform trade studies based on data driven analysis to optimize architectures

- Add custom data
- Create analysis model
- Calculate mass roll-up data
System Composer
Tackle Architecture complexity with spotlight views
Generate Simulink models from architecture components

Link Simulink models to architecture components

Autogenerated by System Composer on March 25, 2019 2:00 pm EST
Simulink: A Multi-Language Simulation Environment

Dynamic Systems

State Machines

Discrete-Event Systems

Physical Modeling

Object-Oriented
Learn More

- Simulink Requirement Webpage
- System Composer Webpage
- System Modeling and Simulation Webpage

- Trial