Allocation Workflows for Architectures and Requirements

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Poll Time!

- What challenges do you face today in your system engineering process?
  
  a) Multiple tools are needed  
  b) Tools are hard to learn  
  c) Responding to changes  
  d) Tracing between artifacts  
  e) Lack of execution and analysis  
  f) Synchronization with design
What we’ve heard from YOU

- Model Based Systems Engineering is a huge improvement over document-based methods
- Existing tools are often missing key capabilities
Why MBSE with MathWorks Tools?

- Be Intuitive
- Tackle Complexity
- Facilitate Traceability
- Enable Implementation
Key Takeaways

- You can import, write, and store textual requirements right in the same environment as your architecture and design models.
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- You can assess the completeness of your system by visualizing those relationships.
Typical System Engineering Tasks

- Stakeholder Needs
- Requirements & Use Cases
- Architecture: Structure & Behavior
- System Characteristics
- Multiple Viewpoints
These arrows represent important relationships and dependencies. How do we keep track of them all?
Exchange data with third party requirements tools

- **Import from:**
  - Word / Excel
  - IBM® Rational® DOORS®
  - DOORS Next
  - ReqIF™ standard

- Synchronize changes from source

- Edit and add further details to import

- Export ReqIF
  - Enables roundtrip with external tools
How do we organize our requirements and show the relationships between them?
Stakeholder Needs

Functional Requirements

System Requirements

Hardware Requirements

How do we link requirements to the corresponding architectures?

- Functional Architecture
- Logical Architecture
- Physical Architecture

WHO

WHERE
ResSys1.1.1: Cooling shall be applied.

- Sense Temperature
- Determine if cooling is needed
- Turn motor on or off
Export links for traceability to model and test

External Requirements

Internal Requirements

Simulink Requirements

- crs_req
  - 1
  - 2
  - 2.1
  - 2.2
  - 2.3
  - 3
  - 4

References to crs_req.docx
Overview
System overview
System inputs
Cruise control mode indicator
Cruise control modes
Functional Requirements
Interface specification

Navigate to model and test
How do we show the relationships between architectures?
Allocating between architectures
Assess different allocation scenarios quantitatively

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Who is doing Model Based Systems Engineering with MathWorks tools?

Rolls Royce, UK Expo, Oct 2019


Who is doing Model Based Systems Engineering with MathWorks tools?

MathWorks Automotive Conference 2021

Felix Raab, Bosch

Sudeep Kulkarni, Mercedes-Benz
New features in R2021a

- System Composer
  - Sequence diagrams
  - Stateflow charts in components
  - Software architectures

- Simulink Requirements
  - Editor improvements
  - Multi-artifact traceability matrix
MATLAB EXPO 2021

Thank you