Automated Requirements Verification using SysML

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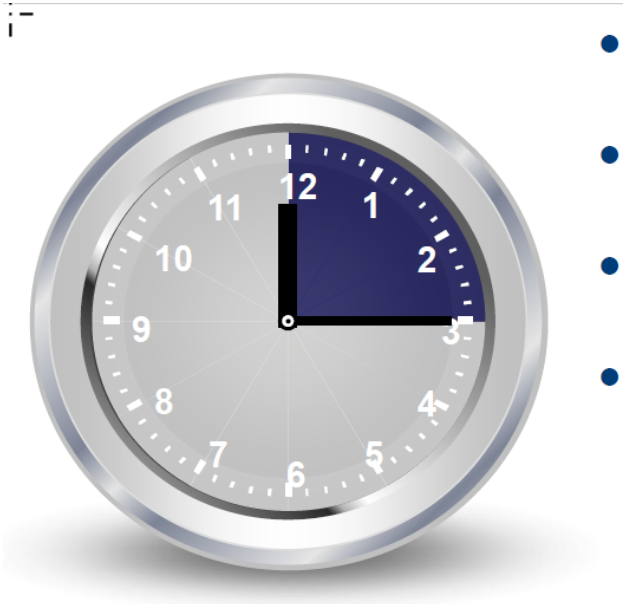
About Me

Saulius Pavalkis

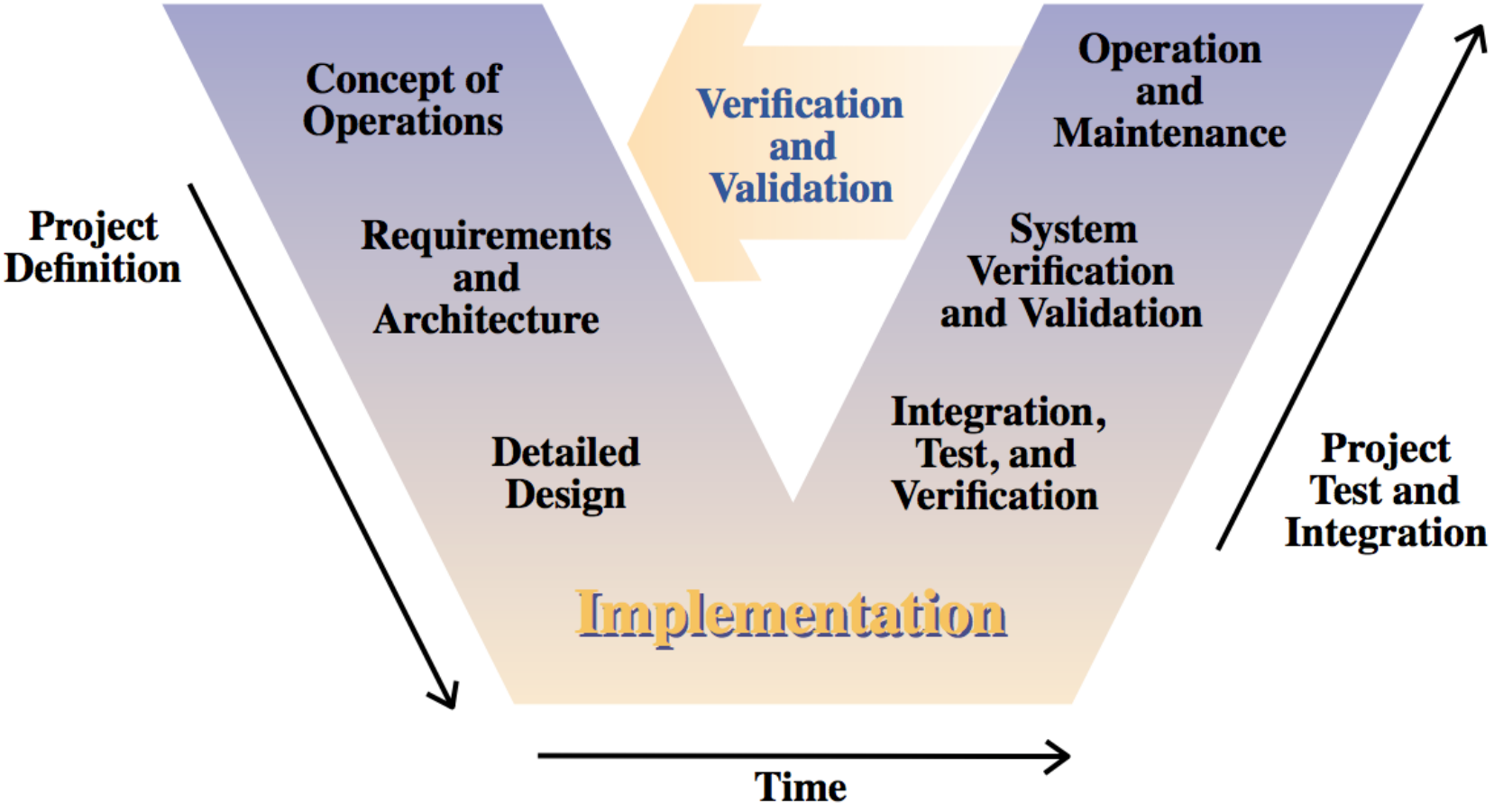
- **Chief MBSE Solutions Architect**, training and consulting companies as: Ford, Orbital ATK, Boeing, Google, Abbott, Raytheon, UTAS, NYTA, SMEE, NASA, BAH.
- **PLM Product Integrations Manager**, working with all major PLM vendors.
- Former **Analyst** on the MagicDraw R&D team for over 10 years.
- **Major expertise area** is MBSE, Requirements engineering, PLM, Traceability.
- **Ph.D.** from Kaunas University of Technology (KTU) in model traceability area. Former **researcher** at Kaunas University of Technology on multimillion projects.
- **Research and technical articles** in model-based solutions presented at INCOSE IS, NDIA. Check modeling community blog (blog.nomagic.com) for more.
- **Representative at INCOSE CAB**.

Agenda



- Introduction to V&V
- Requirements modeling concepts
- Cameo Systems Modeler demo
- Questions & Answers session

V-model

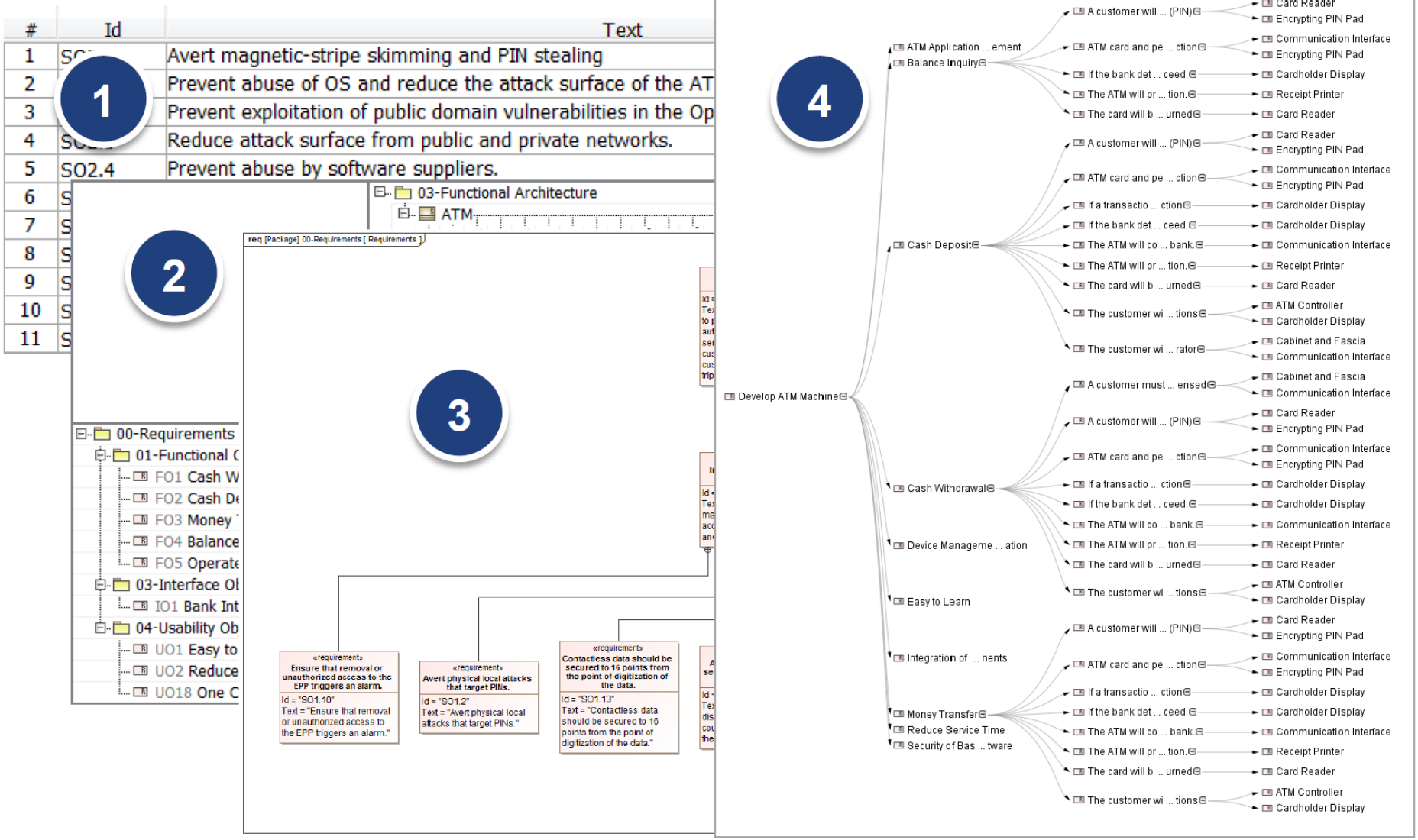

Concept of Operations
Requirements and Architecture
Detailed Design
Implementation
Integration, Test, and Verification
System Verification and Validation
Operation and Maintenance
Verification and Validation
Project Definition
Project Test and Integration
Time

Verification and Validation

- **Validation**
  - "Are you building the right thing?"
  - Always against the real world or user needs

- **Verification**
  - "Are you building it right?"
  - Always against the requirements

Requirements in SysML



Requirements Verification in SysML

Requirements can be customized by adding properties such as verification method, verification status , criticality, risk, and requirements category.

The verifyMethod property includes :

- Inspection
- Analysis
- Demonstration
- Testing

Verification Methods

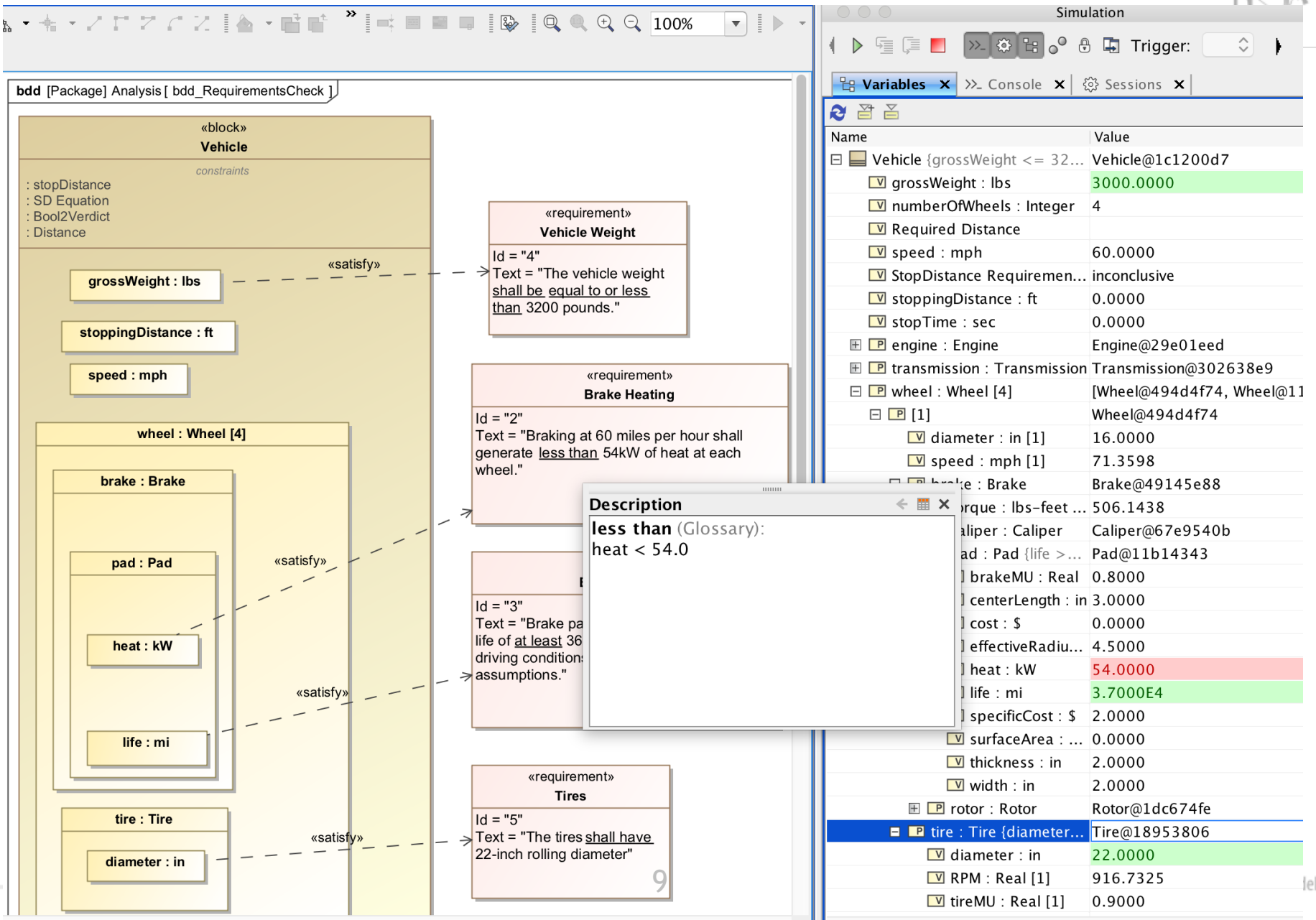
- The test case definition and execution depends on the method of verification
- For example, the method of verification for a system requirement that “The vehicle shall weigh between 98 and 100 pounds” may be performed by testing or analysis.
- To **verify the requirement by testing**, a test case is defined to weigh the system on a scale and compare the measured weight against the required weight.
- To **verify this requirement by analysis**, the estimated weight of each component is summed to estimate the system weight. In the latter case, a parametric diagram may be used to verify the requirement by analysis.

Steps to Automate Requirements Verification

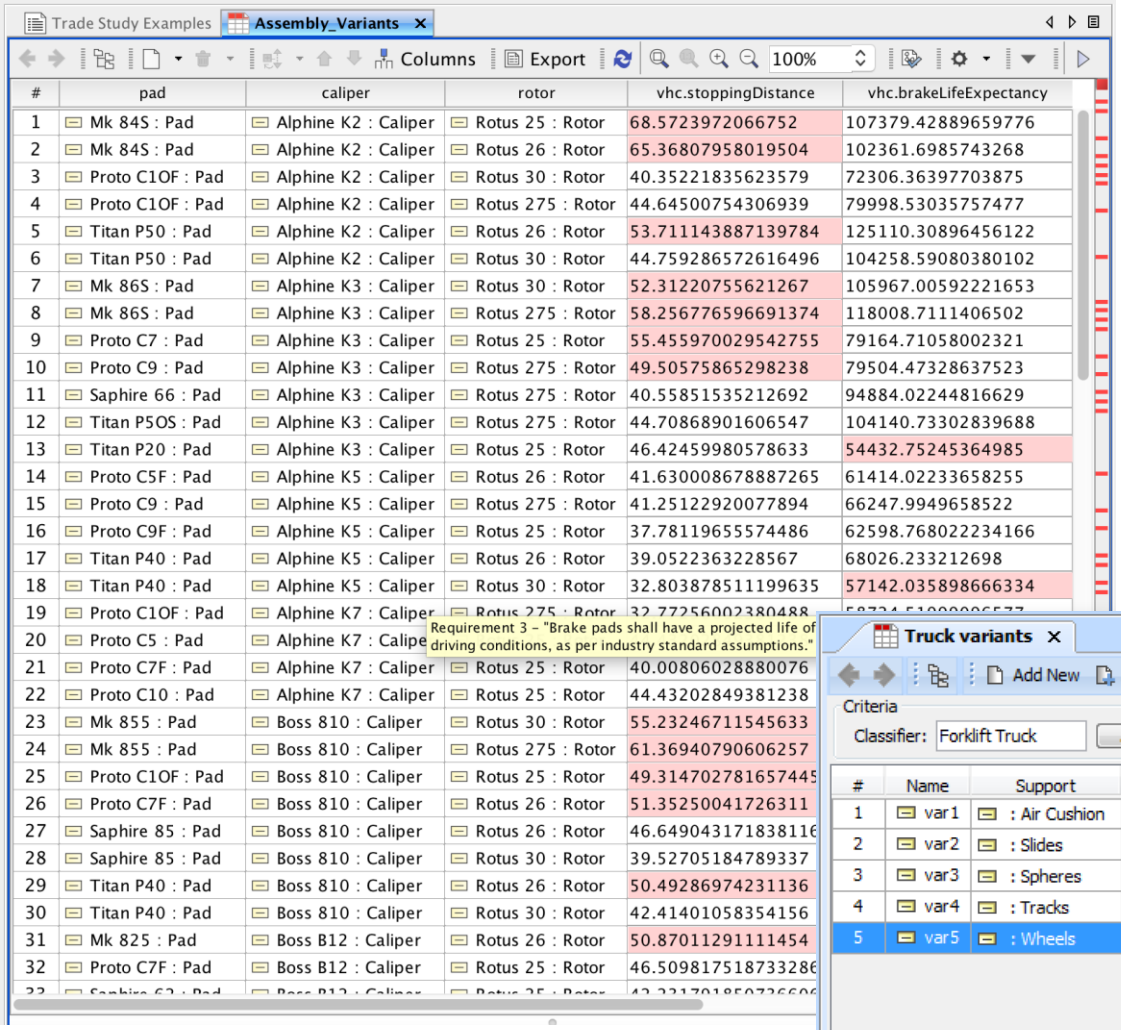
Steps

- Refine, formalize requirement by the Constraint Block
- Define analysis context
- Use constraint block in analysis context
- Bind system parameters to constraint parameters
- Evaluate default or alternative system configurations
- Verify requirements
- Capture verification results

Text-based Requirements verification



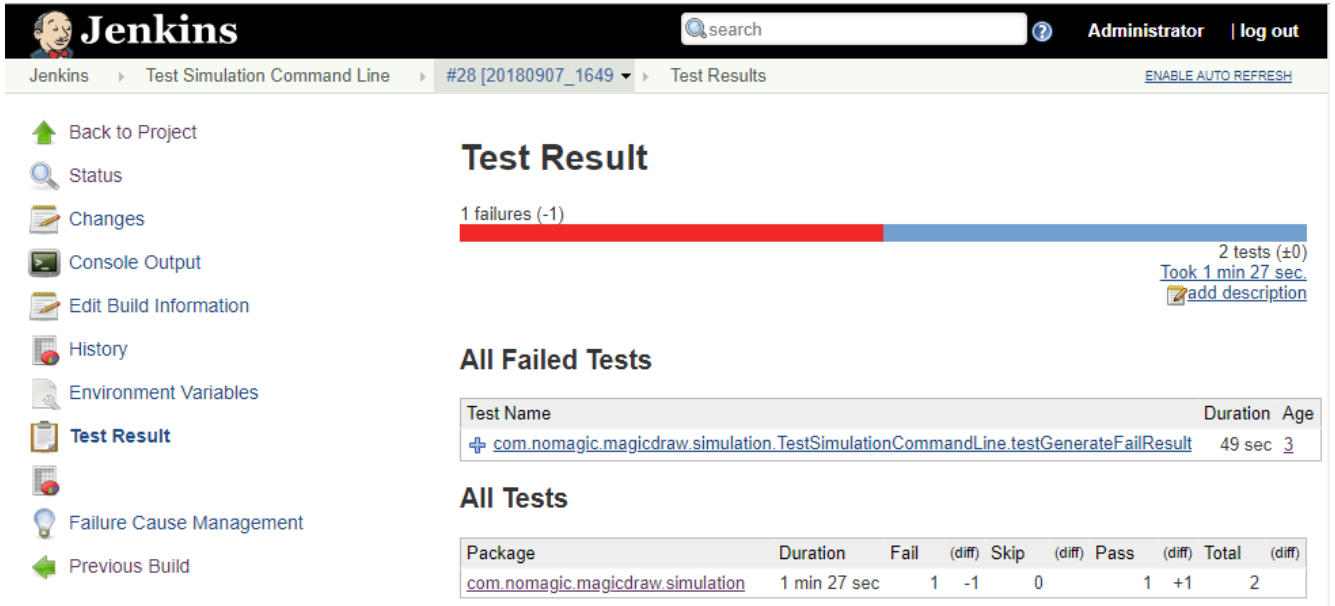
Trade-off analysis



- Parametric alternatives
- Topological alternatives
- Finding the best design
- Help decision making

Automate Testing Execution

- Simulation can be executed through command line and show test results through Jenkins, as another alternative to run the project.
- You can create JUnit test cases and configuration files and set up Jenkins for automated testing.



Demo

Cameo Systems Modeler v19.0 (enterprise edition)

Questions

The Truth is in the Models

Thank You!

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