ModelCenter MBSE

The next generation MBSE to Analysis integration tool

Introductions

- **Subodh Chaudhari**
  - **Sr. Application Engineer at Phoenix Integration**
- **Dave Mastrorocco**
  - **Sales Manager, US East at Phoenix Integration**

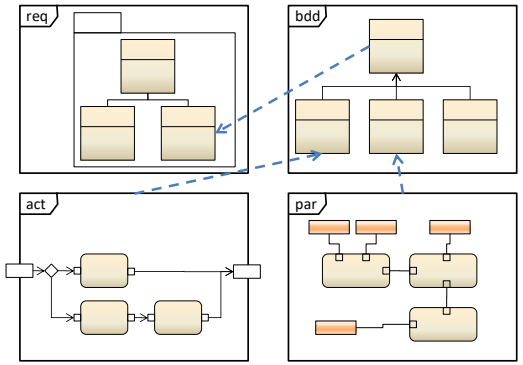
- **ModelCenter the framework for Model Based Engineering**

https://en.wikipedia.org/wiki/Paper_clip#/media/File:Wanzijia.jpg

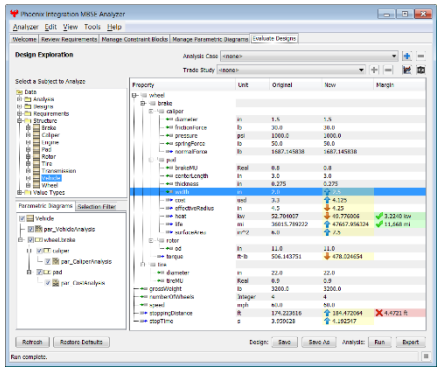
Shaan Stationery

Phoenix Integration MBSE Pak

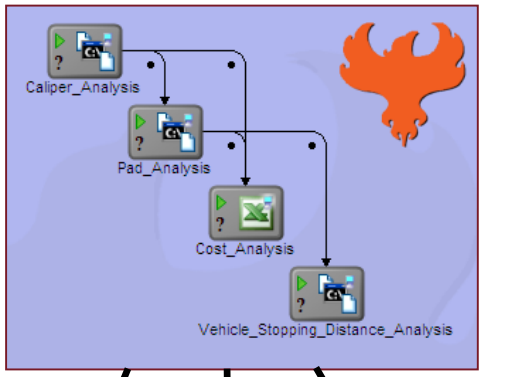
Systems Engineering: Architectural Model



MBSE Pak



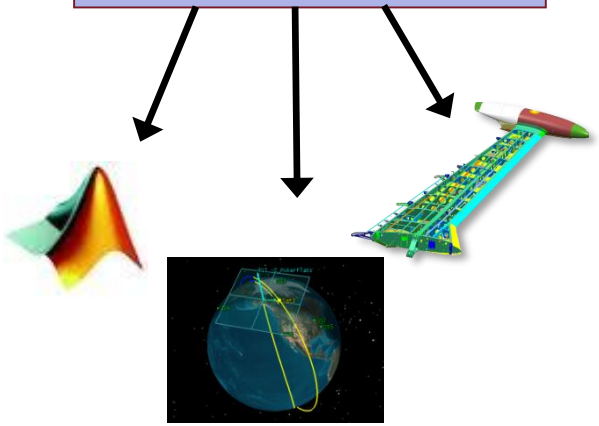
Domain/Discipline Engineering: Executable Analysis Model



Connect systems architecture models with engineering analyses to calculate system performance, check requirements, and perform design trade-offs

Capabilities

- **Execute SysML parametric diagrams to evaluate designs**
- **Perform requirements compliance analysis using modeling and simulation**
- **Perform design trade-off studies**
- **Update SysML models with analysis results**
- **Import engineering analyses into a SysML model**



Engineering Analysis

Stevens Institute / 2018 NAVAIR Study

- **Modeling Framework Requirements**
  - **HPC enabled**
  - **Single Source of Truth**
  - **Integration of Multi-domain/physics models**
  - **Method for Model Integrity**
- **Systems Engineering (SE) activities… in the context of a Digital Thread.**

SYSTEMS ENGINEERING RESEARCH CENTER

Transforming Systems Engineering through Model-Centric Engineering

Technical Report SERC-2018-TR-103

February 28, 2018

Principal Investigator

Dr. Mark Blackburn, Stevens Institute of Technology

Research Team

Georgia Tech University: Dr. Russell Peak, Stephen Edwards, Adam Baker, Marlin Ballard

Stevens Institute of Technology: Dr. Mary Bone, Dr. John Dzielski, Dr. Paul Grogan, Ralph Giffin, Robert Hathaway, Dr. Deva Henry, Dr. Steven Hoffenson, Dr. Benjamin Kruse

University of Maryland: Dr. Mark Austin, Maria Coelho, Dr. Leonard Petnga

Sponsors

NAVAIR, DASD (SE)

Contract No. HQ0034-13-D-0004

Research Tasks: 48, 118, 141, 157, 170

Report No. SERC-2018-TR-103

Blackburn, Mark, et al. SERC, RT-170: https://archive.sercuarc.org/publications-papers/technical-report-transforming-systems-engineering-through-model-centric-engineering-4/

Stevens Institute Phoenix Integration Webinar

Dr. Mark Blackburn, Ph.D.
Research Professor
Stevens Institute of Technology

Why did you choose ModelCenter?

"The key reason was:

- We interacted with over 30 organizations … they all used ModelCenter
- Most advanced tools … Some of the tools don't do that
- So you spend a lot more time working on the tools rather than looking at the research"

Dr. Mark Blackburn, PhD.

MBSEPak Lessons learnt

Cleaner, easier interface

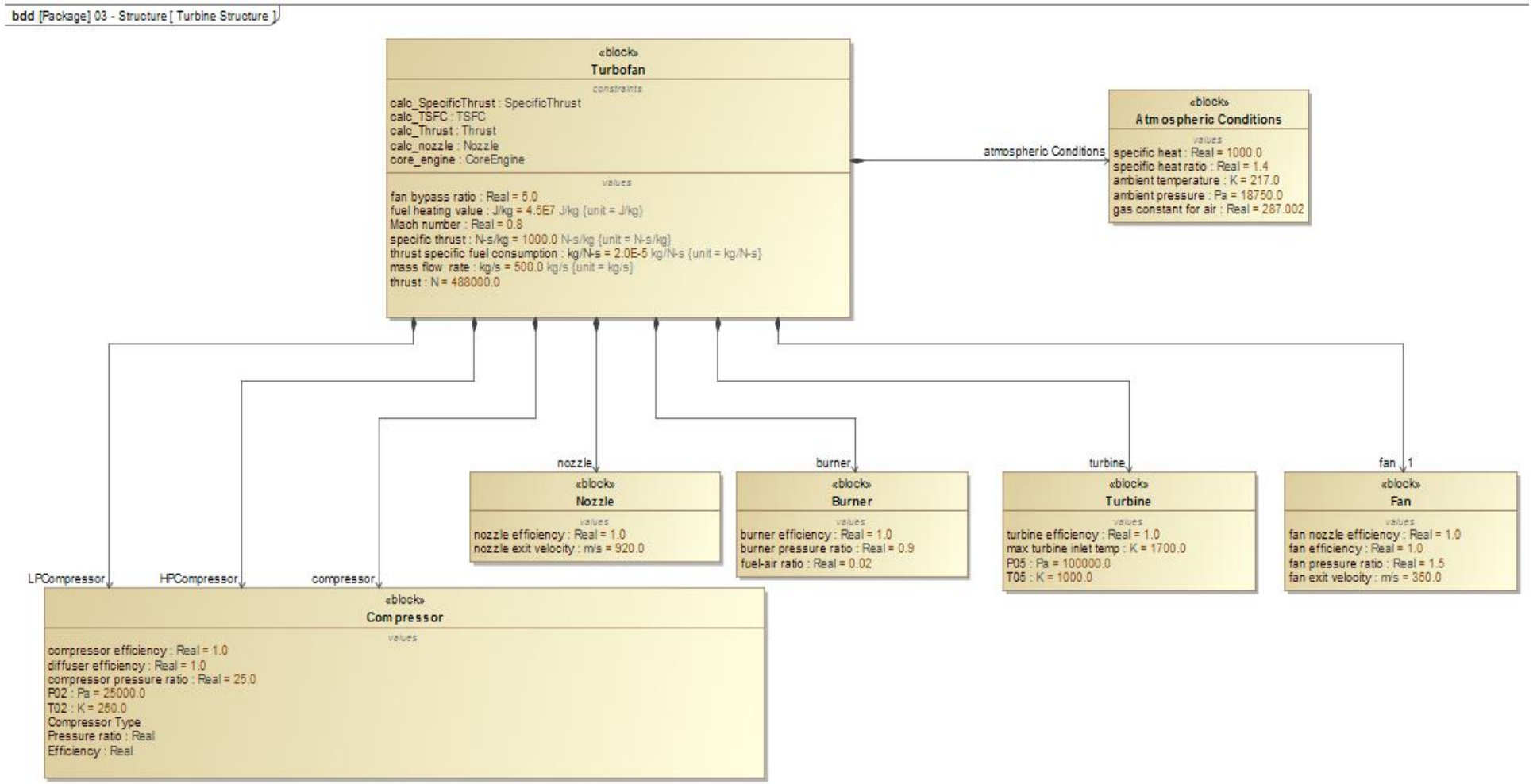
Simple to use with repeatable integration patterns

Flexible enough with ANY systems language

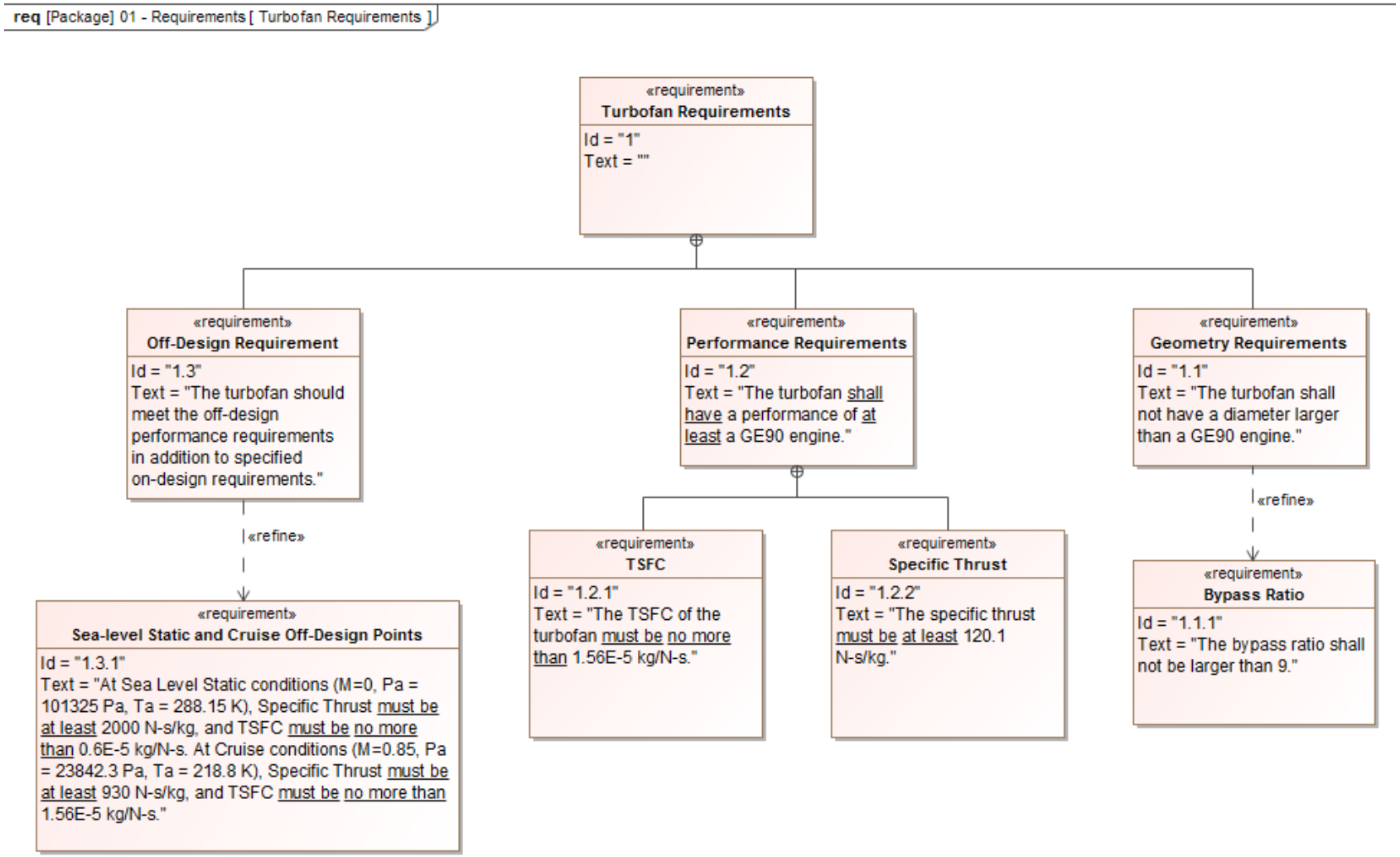
Flexible enough to integrate with ANY modeling tool

Versatile to take us into the future

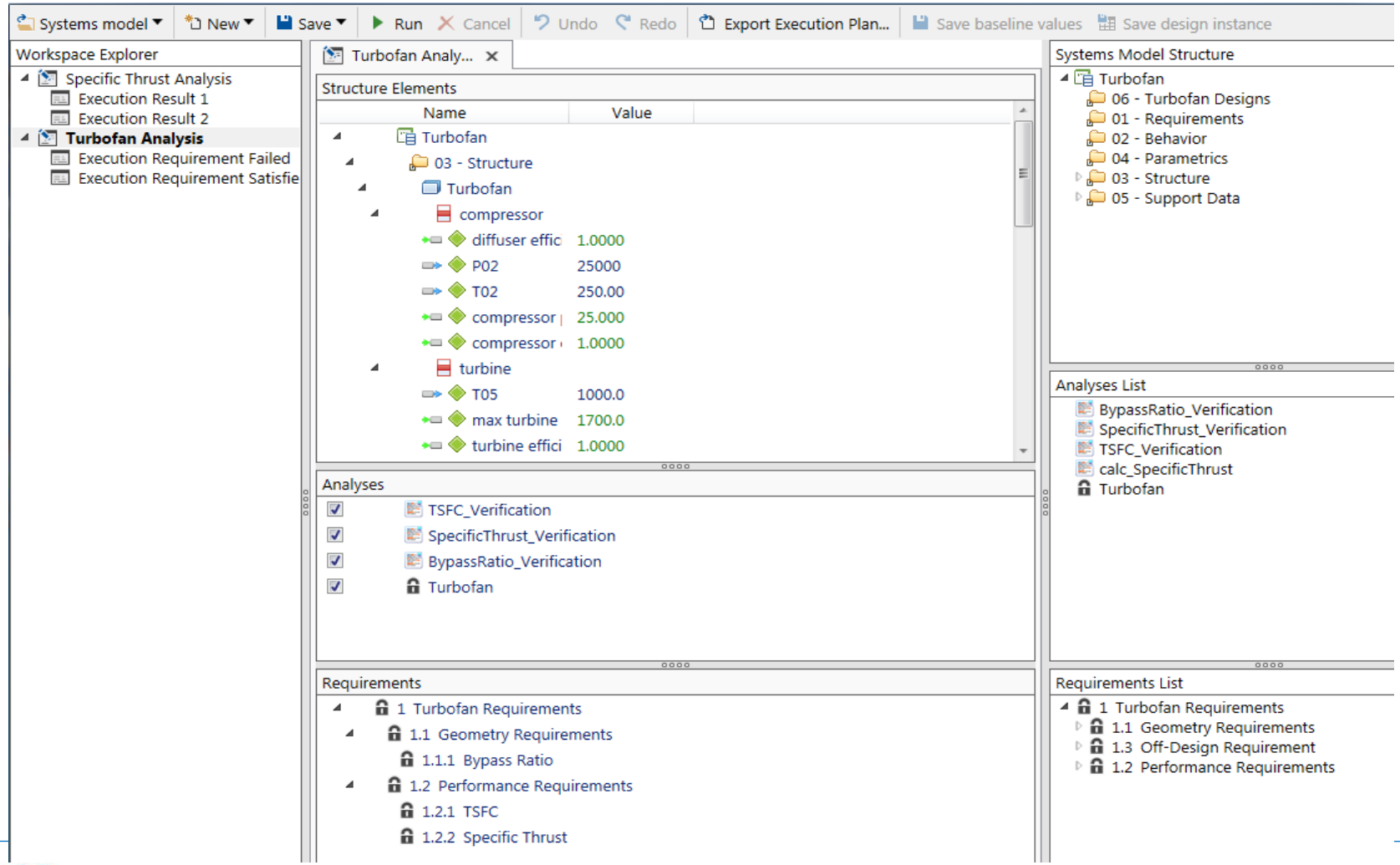
Turbofan structure



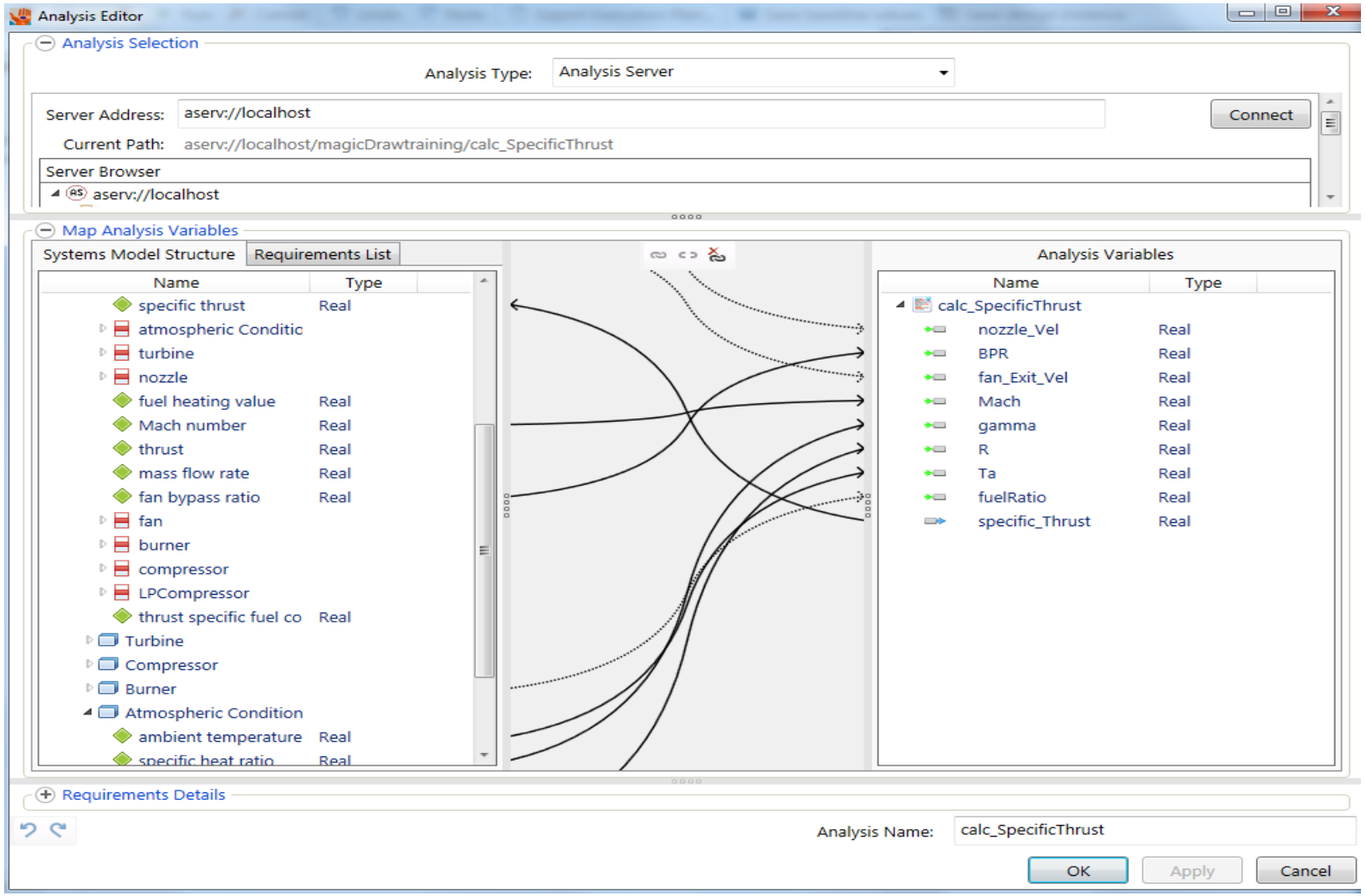
Turbofan requirements



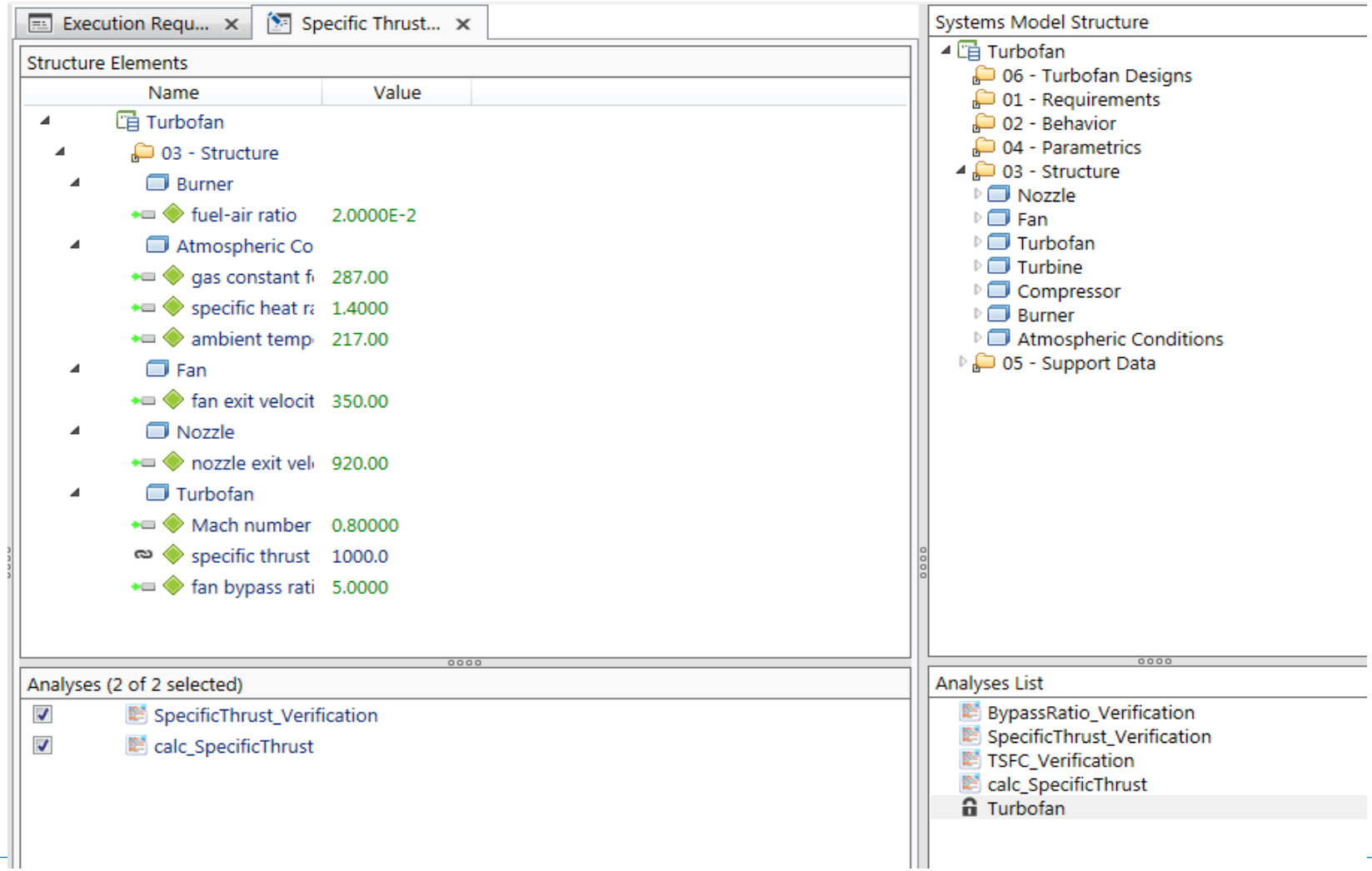
ModelCenter MBSE



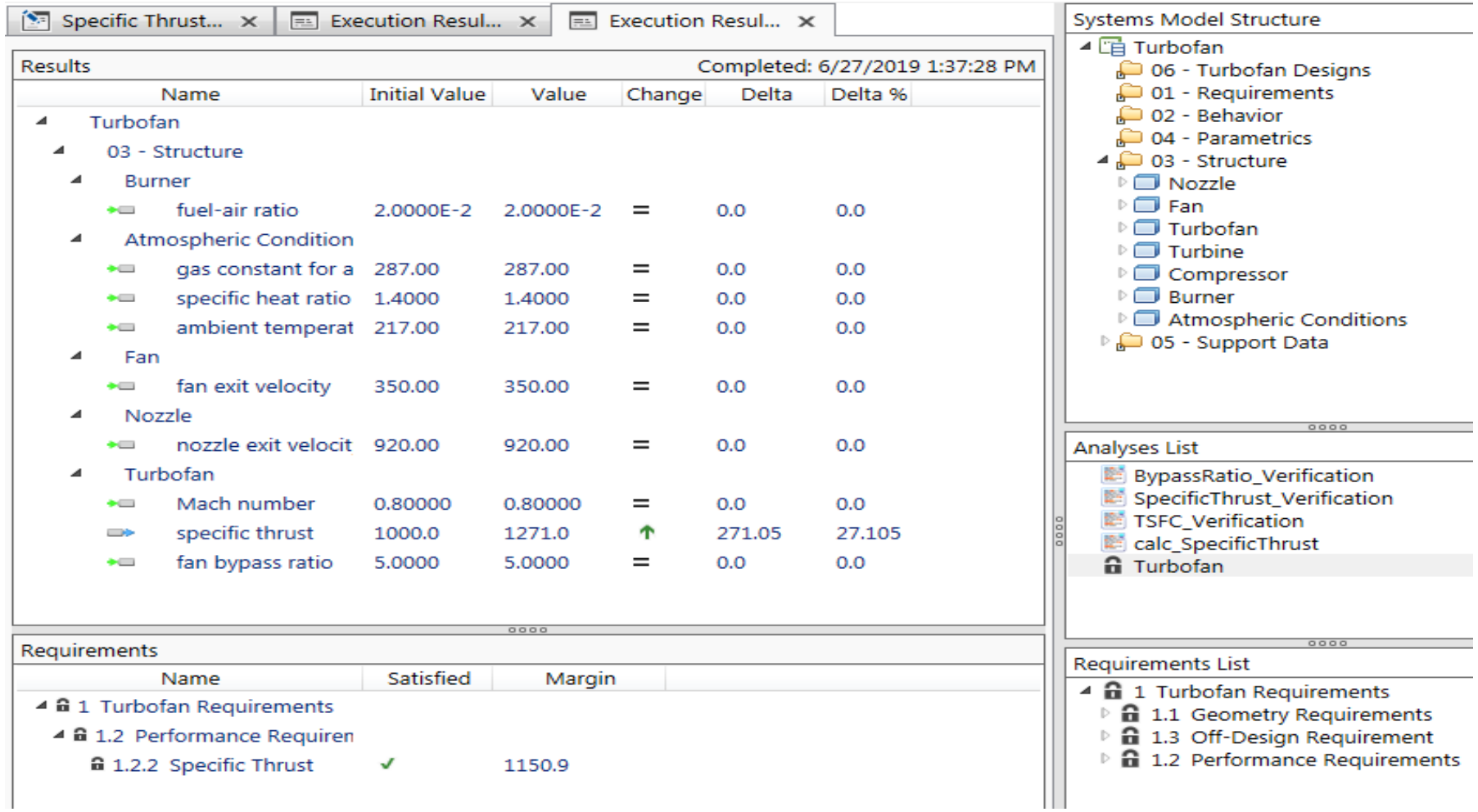
Link system model elements to analytical models



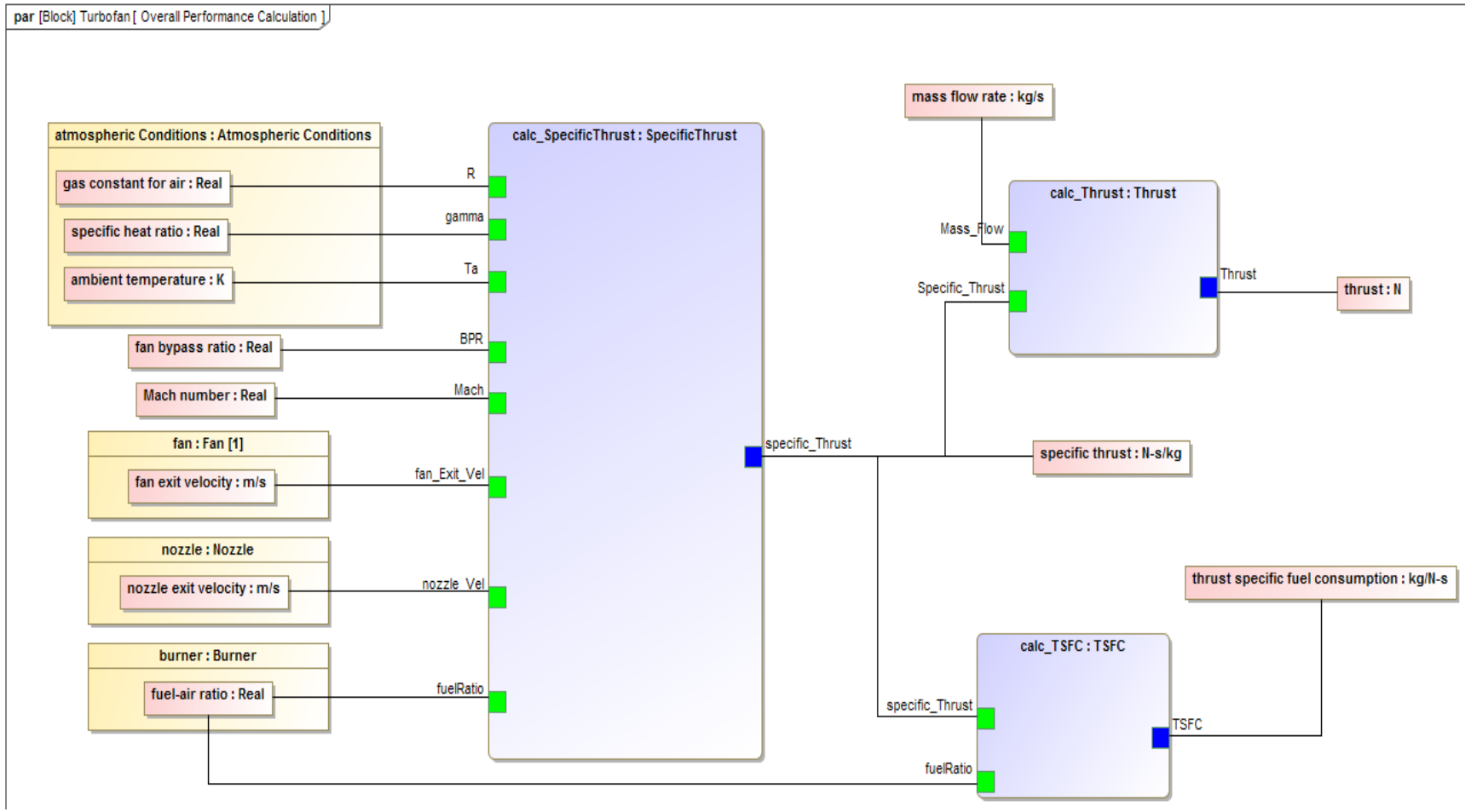
Create execution plan and execute



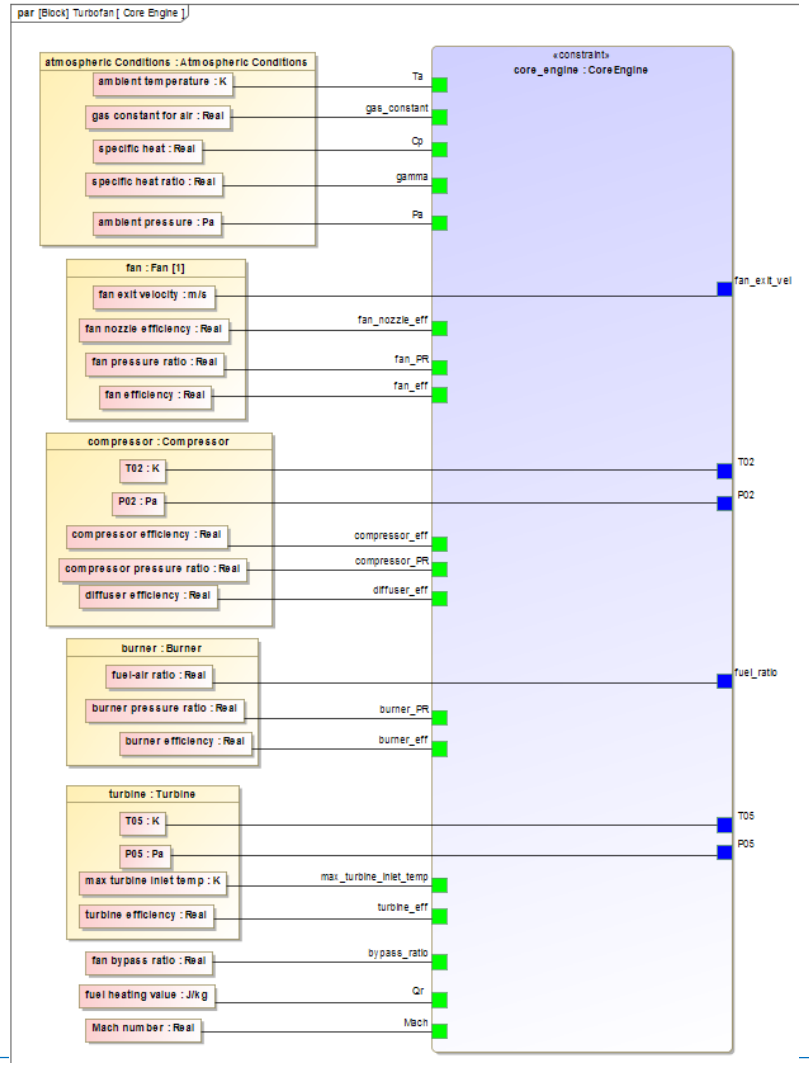
Execution results and requirement verification

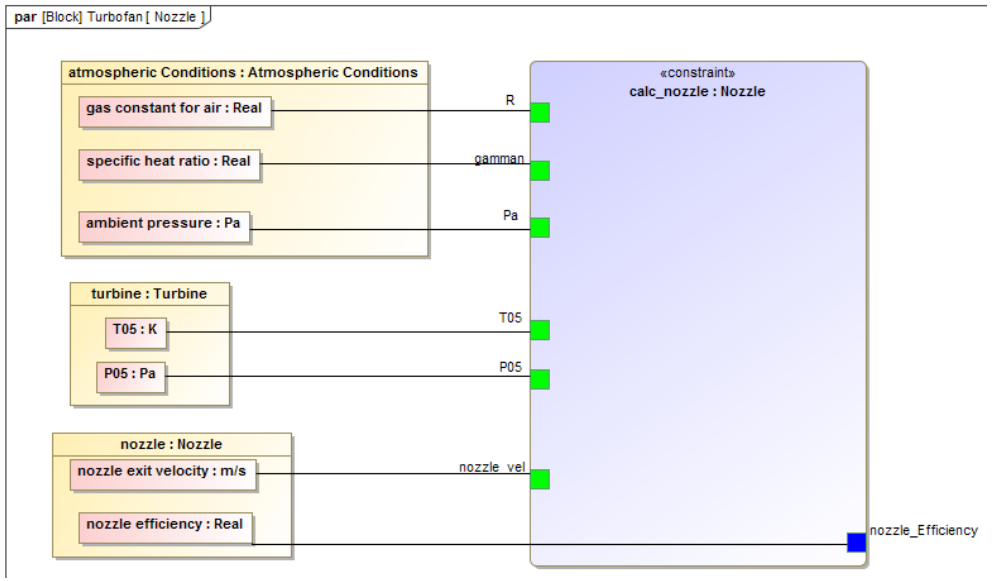


Performance calculation parametric diagram

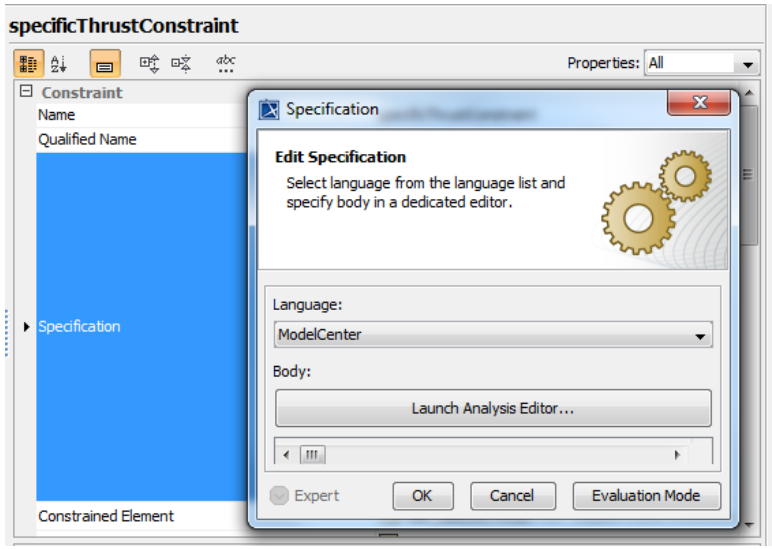


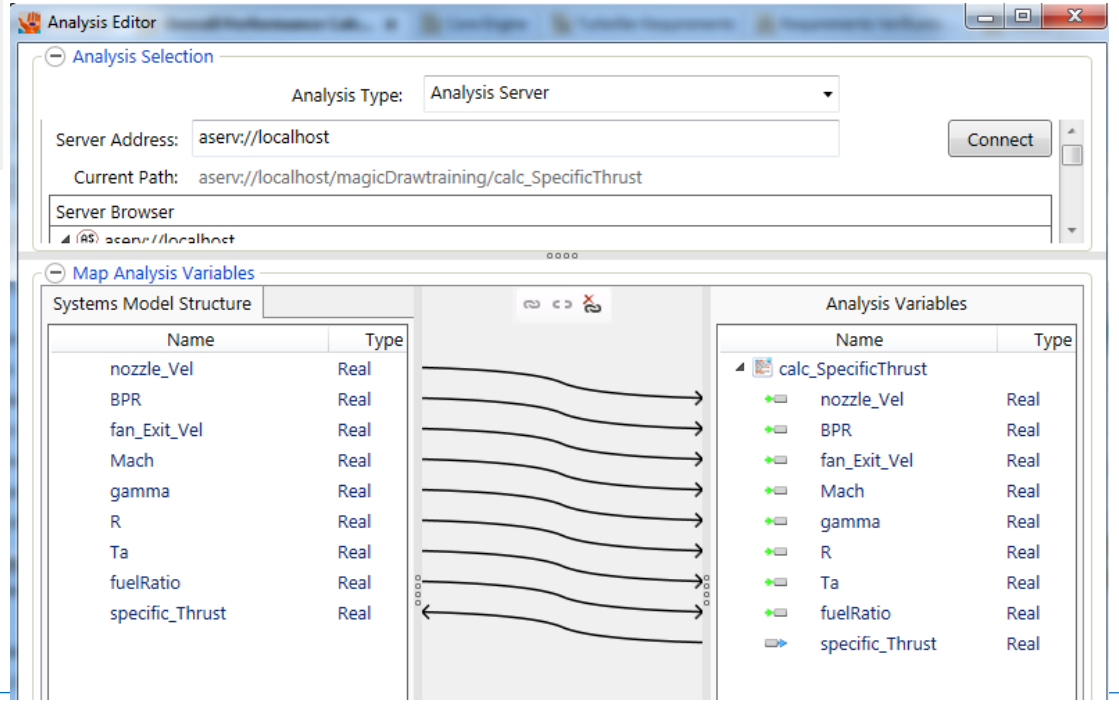
Core Engine and Nozzle parametric diagram



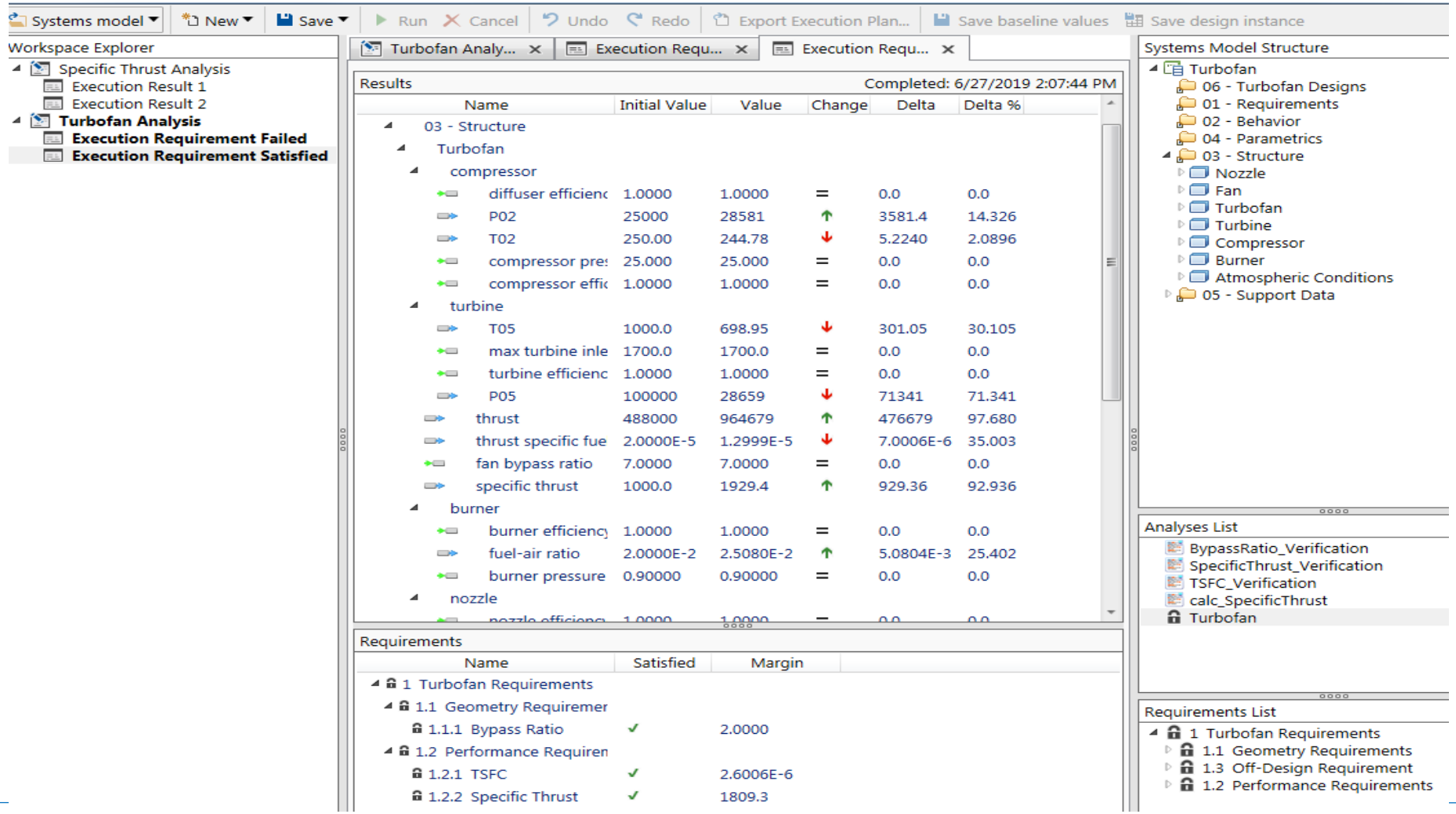


Connect constraint to ModelCenter

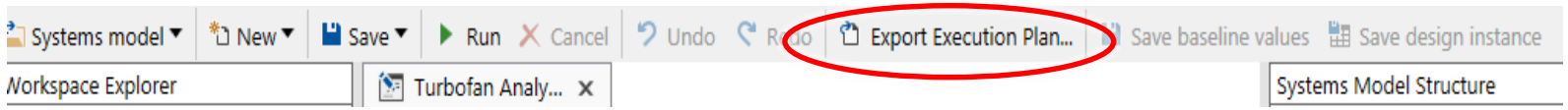


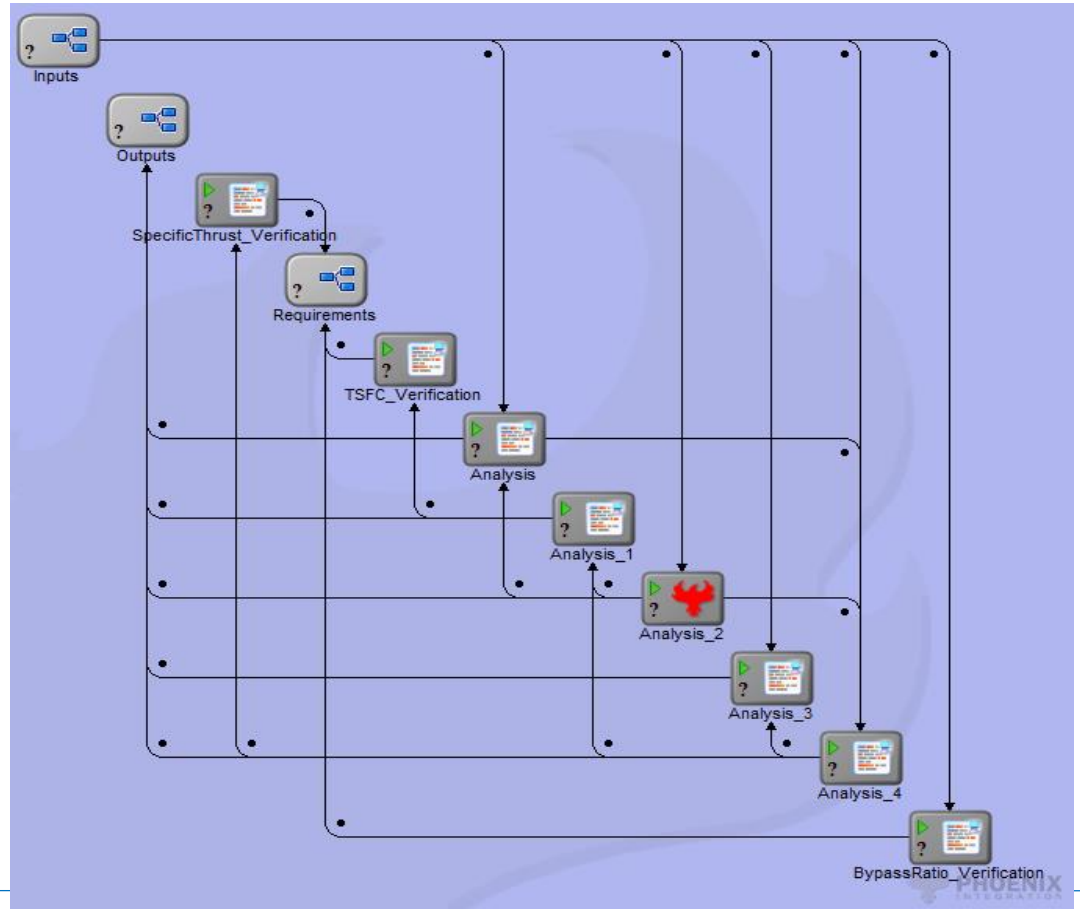


Execution results parametric diagram

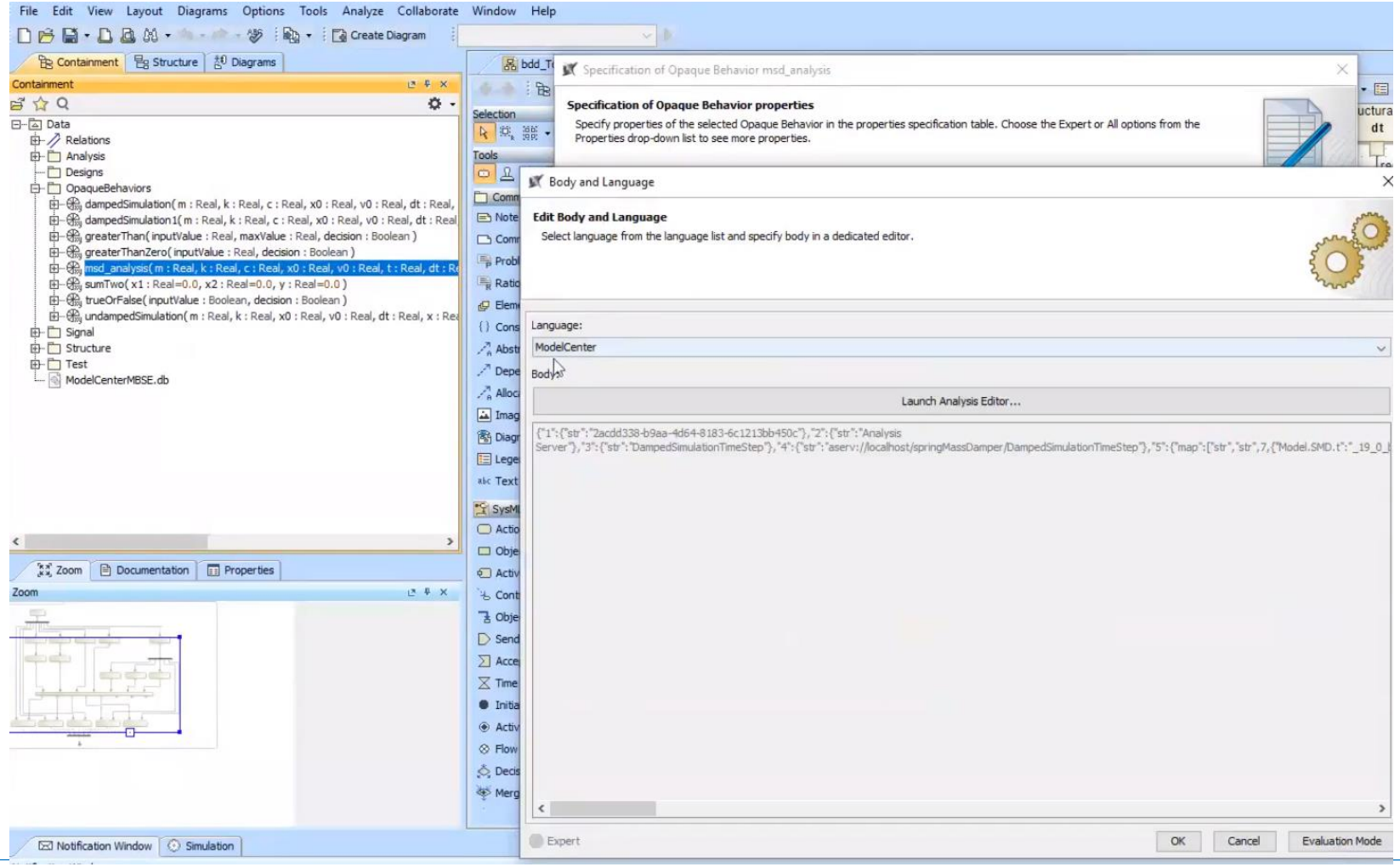


Export ModelCenter workflow





Connect opaque behaviors to ModelCenter



ModelCenter MBSE

Initially release in October 2018
- **Initial feature set**
- **API for vendor integration**

Integration with PTC Integrity Modeler shortly after

Integration with MagicDraw

Integration with Vitech GENESYS

ModelCenter MBSE

Cleaner, easier interface

Simple to use with repeatable integration patterns

Flexible enough with ANY systems language

Connect to system model elements

More flexible and powerful requirements verification

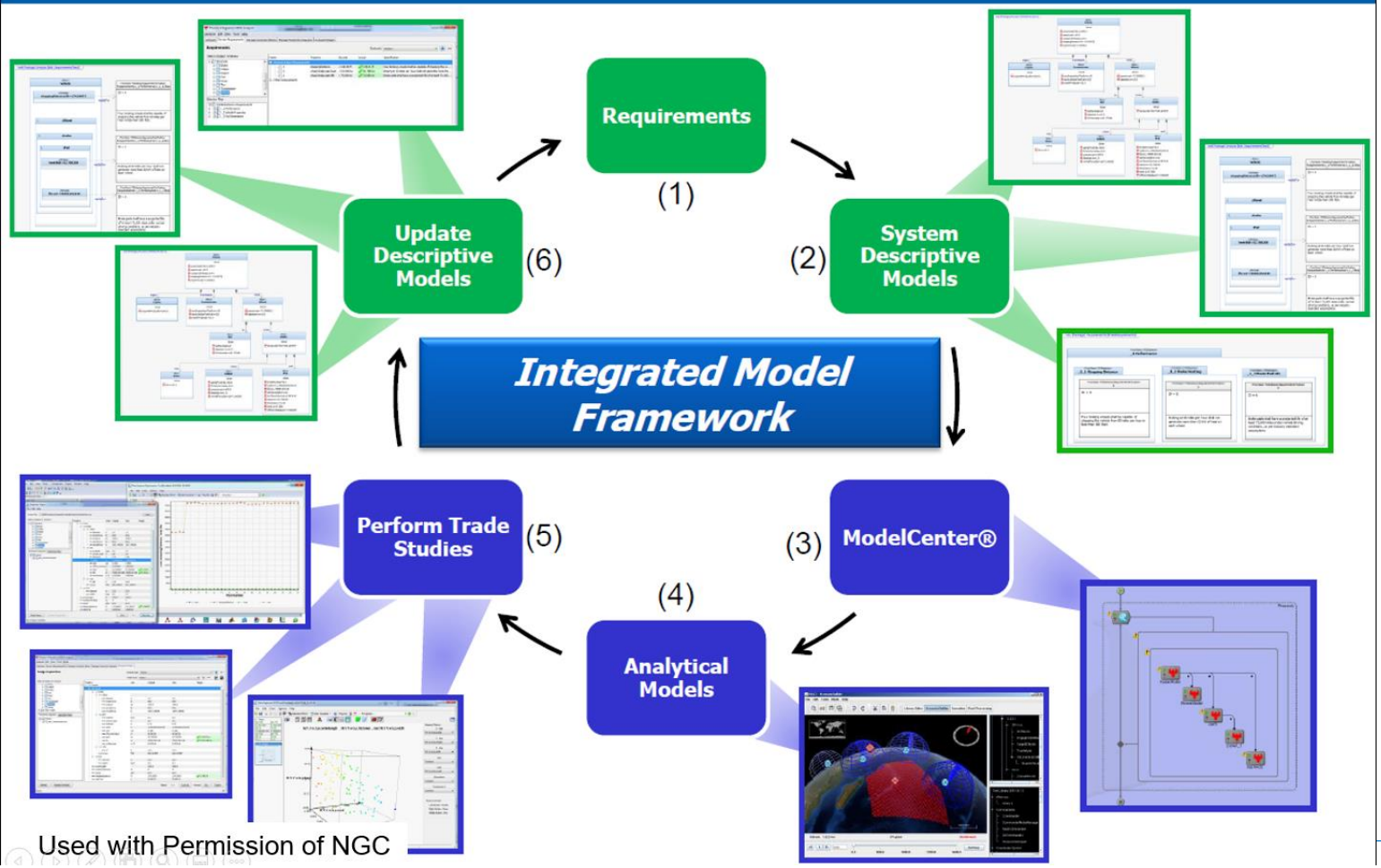
Update MBSE model with design

More native powerful integration with Behavioral diagrams

Integrated Model Framework Example

Descriptive to Analytical and Back

NORTHROP GRUMMAN



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MBE at Northrop Grumman

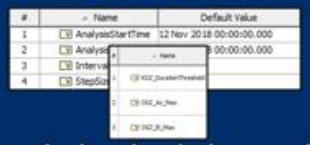
- Proven results at NGES with MBE with demonstrated
  - Reduction in cost
  - Reduction in schedule
  - Improvement in delivered quality
  - Higher customer engagement in the engineering process and satisfaction with the results

Presented at Phoenix Integration International User's Conference - April 14, 2015
- Guy Babineau, Chief Engineer

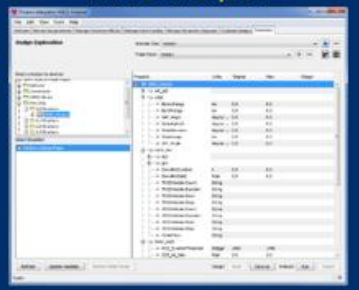
Overview
Challenges
Objectives
Approach
Modeling
Simulating
Results
Reflections
Future Work

SIMULATION PROCESS OVERVIEW

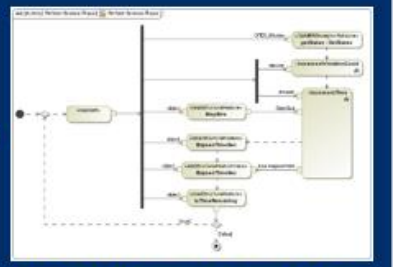
1. Enter simulation settings and constraints.



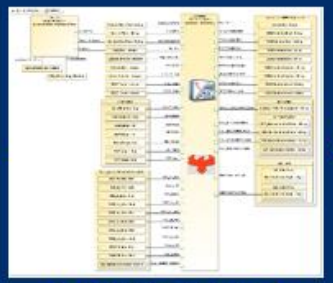
2. Initiate simulation from MBSE Analyzer.



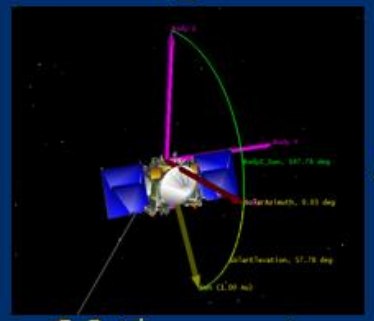
3. Step through the mission simulation.



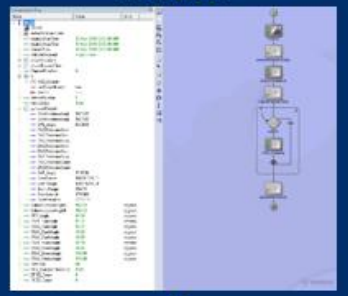
4. Point to external analysis tools.



5. Retrieve parameter values from STK.



6. Evaluate STK parameters; return results to MBSE Analyzer.



7. Display simulation results for each time step.

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Questions?