ModelCenter MBSE: The Bridge Between Systems Engineering and Multi-Fidelity Analytical Models

Phoenix Integration Tony Davenport Subodh Chaudhari



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ModelCenter MBSE: The Bridge Between Systems Engineering and Multi-Fidelity Analytical Models

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Abstract:

- This session will describe and demonstrate ModelCenter MBSE, an analysis integration framework for CAMEO Systems Modeler, Rhapsody, GENESYS, and PTC Windchill Modeler.
- ModelCenter MBSE allows engineers to integrate analysis tools with any SysML model element to validate system behavior, verify requirements satisfaction, and perform trade studies to optimize the system design, resulting in reduced cost, shortened development times, and higher quality product roll outs.

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Take Calls



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Mobile Banking Mobile Pay **Touch Screen** Listen to Music AR/VR Stream TV and Movies **Mobile Ticket**



Phoenix Integration Presenters

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Presentation Overview

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PHOENIX

- ModelCenter MBSE
 Capabilities Overview
- Example of a ModelCenter workflow with NoMagic Cameo and PTC Windchill Modeler*

*Formerly PTC Integrity Modeler

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Provide Systems Engineers access to Analytical workflows



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Share requirements between Systems and Analytical engineers

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Validate requirements against high fidelity analytical and simulation
 models





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Integration with Behavioral Diagrams

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Native behavioral simulation support

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Allow Systems Engineers to access Multi-Disciplinary Analysis and Optimization (MDAO) algorithms and post-processing





Integration with Teamwork Cloud

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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

Fully Integrated Digital Thread



Integration Example: ESAVE N² Model

(Efficient Supersonic Air Vehicle Exploration)

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- Mission
- Structures
- Flight Controls
- Constraints
- Propulsion
- Structures
- Flight Controls
- Variables
- Vehicle
- Propulsion
- Objective

MDAO Design / Analysis Modes

- Interactive design space exploration
- Design of Experiments (DoE)
- Response Surface Model (RSM) generation
- Local vs. global optimization studies
- Pareto frontier optimizer
- Gradient based vs. line search



N² Architecture couples disciplines in both inner and outer loops and supports a wide range of trade studies and optimization methods

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ModelCenter MBSE Vendor Integrations



Turbofan model in Windchill Modeler and Cameo

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Turbofan Model in Cameo





Turbofan Model in Rhapsody



ModelCenter MBSE - System Engineer View



ModelCenter MBSE – System Engineer View The Turbofan Model in PTC Modeler

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ModelCenter MBSE – System Engineer View Turbofan model in PTC Integrity Modeler



ModelCenter MBSE – System Engineer View Perform requirement verification



ModelCenter MBSE – System Engineer View Update MBSE model with new design Global Product Data Interoperability Summit | 2020

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ModelCenter MBSE – System Engineer View (Cameo Example) Perform design exploration from System model



ModelCenter MBSE – Subject Matter Expert View





ModelCenter MBSE – Subject Matter Expert View Provide SMEs system context Global Product Data Interoperability Summit | 2020

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Address Requirement Change (Change Request)



Demonstration Summary

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 Demonstrated that ModelCenter can manage many types of system engineering solutions.

- ✓ Made an existing System Engineering model executable
- ✓ Used a Systems Model to drive Subject Matter Expert's simulations
- Validated requirements using ModelCenter to integrate the system engineering model with SME's simulations
- Uploaded or Instanced new system engineering values into the system engineering model from the SME's simulations
- ✓ Allowed SME to run detailed analysis against new system requirements
- ✓ Used Systems Model to perform a Design Of Experiments (DOE)
- Managing a Requirement Change

ModelCenter in the Cloud



ModelCenter Cloud Demonstration



Make simulation expertise accessible to others







Explore designs faster and make better decisions

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Simulation Solution Integrations



ModelCenter® MBSE: Enable Model Based Systems Engineering



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