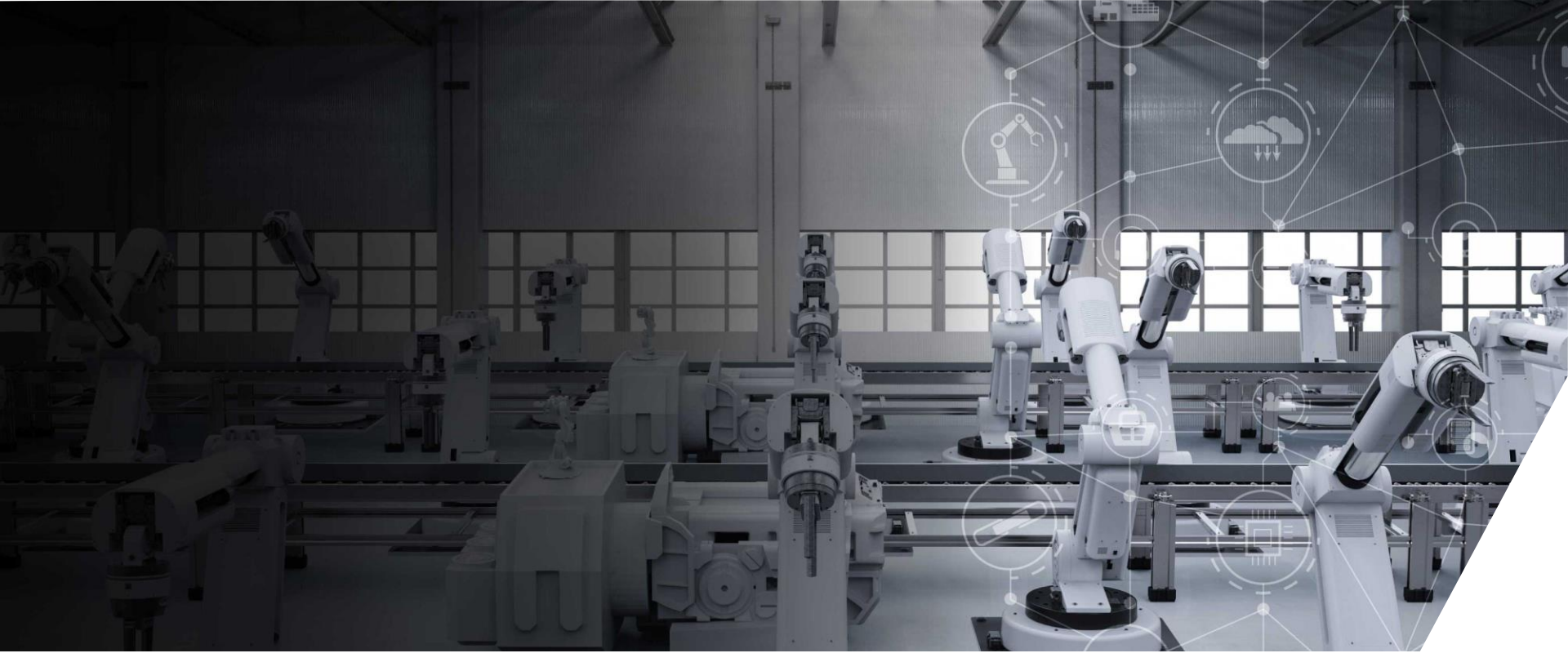
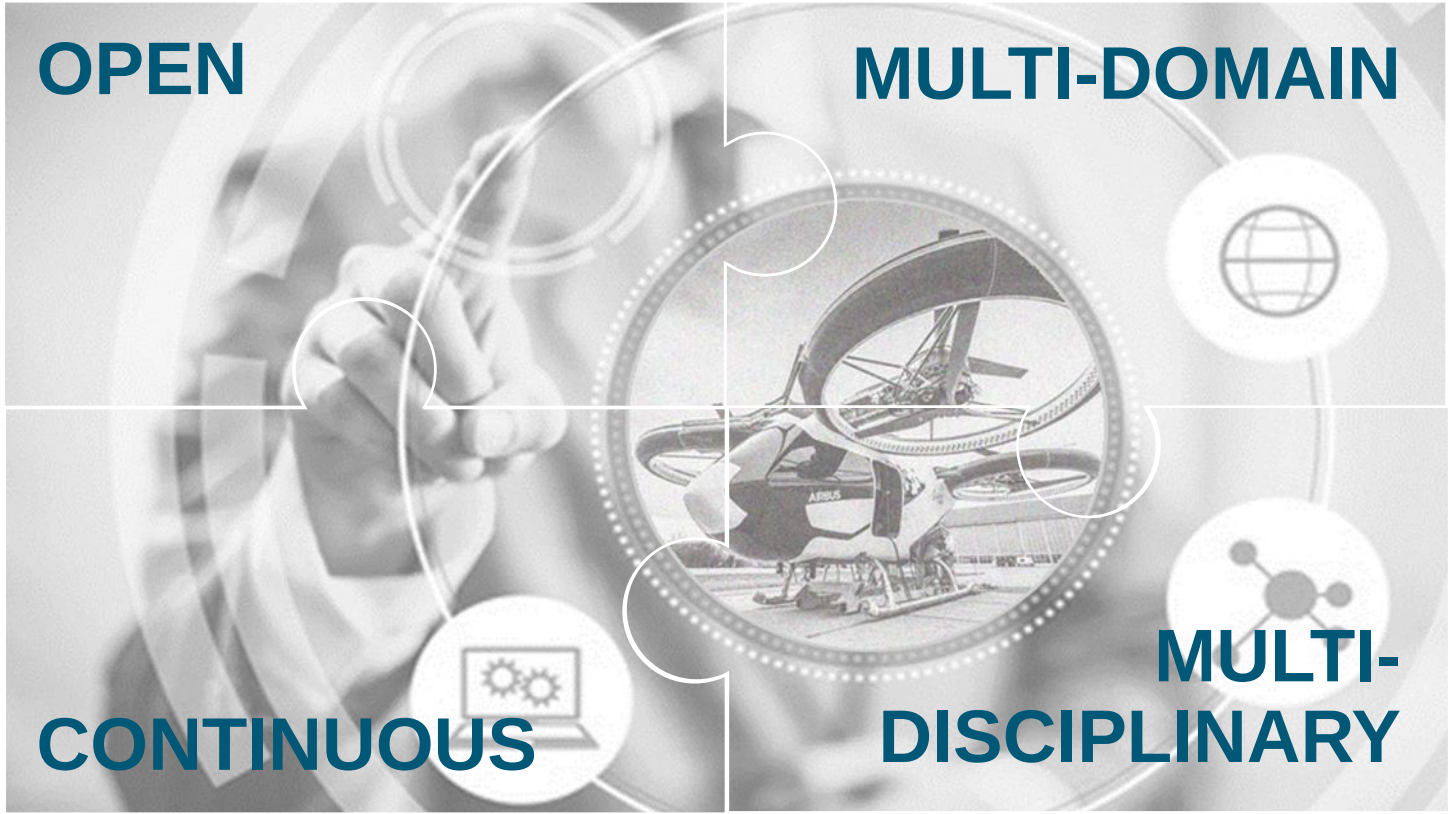


TOWARDS BRIDGING MULTIPLE GAPS - BETWEEN DOMAINS, DISCIPLINES, DEPARTMENTS, LIFECYCLE PHASES

Christian Kehrer / Business Development Manager – System Modeling / 9/16/2020

CHALLENGE

Tools, Methods and Processes need to be...



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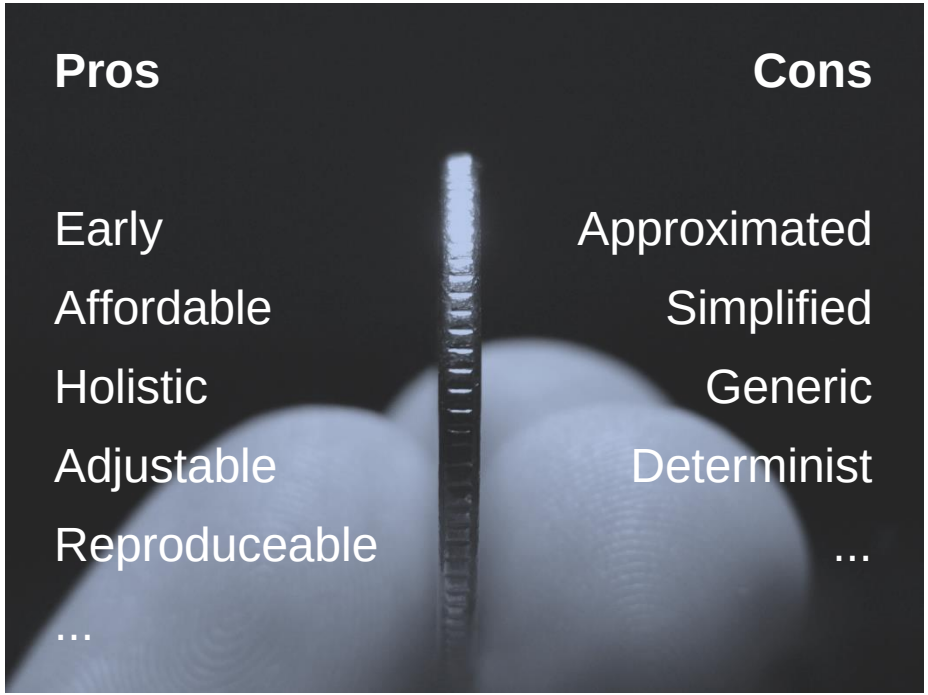
From Development Silos

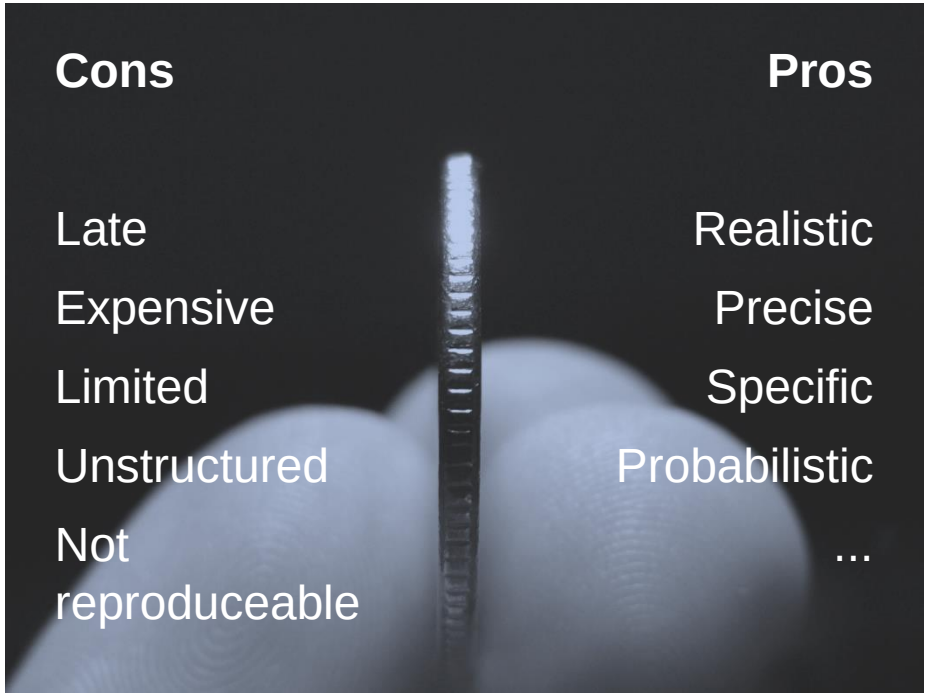
Slowing down innovation

- Disconnected Artefacts
- Incomplete view towards overall systems
- Error-prone, late, expensive
- ...

Why Physics needs Data and Vice Versa



Physics-Based Simulation Models



Real-World Data

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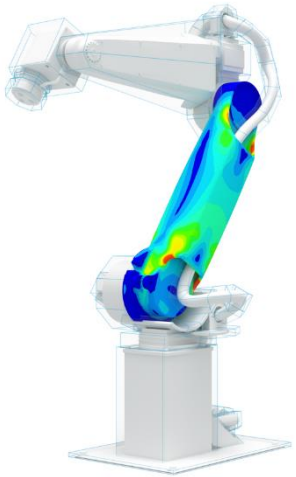
What do you want from your Digital Twin?

Which tasks of a Digital Twin are relevant for your use case?



Physics-Driven Twin

Data-Driven Twin

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(EXEMPLARY) SOLUTION

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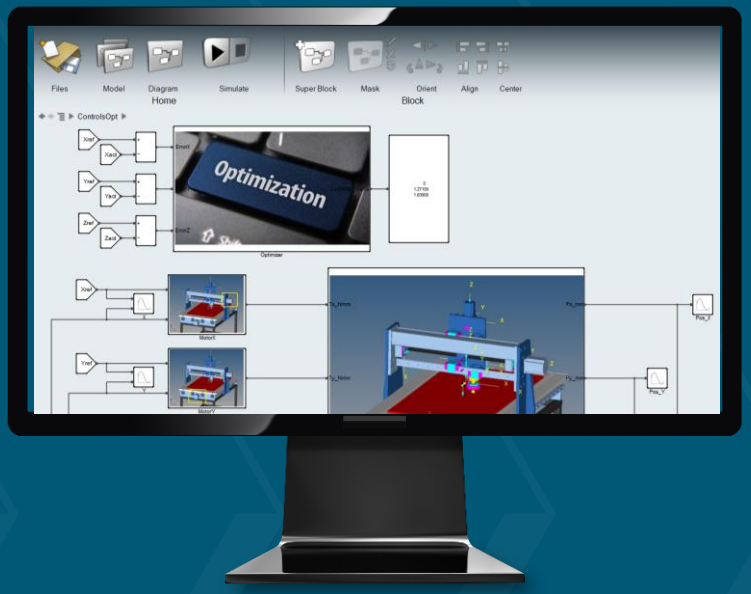
Optimization of a CNC Milling Machine

Improving speed & precision

Optimizing the dynamic interaction of multiple system components combining

- 3D Finite Elements Analysis
- Multi-Body Dynamics and
- System simulation



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Issues of Mechatronic Systems

Where to optimize?

Structure

- Loads?
- Out of spec. deformation

Drives

- Precision, Vibrations, Noise
- Overheating

Control

- Energy consumption
- Commissioning

Open and flexible integration platform

MODELING LANGUAGES

CO-SIMULATION

Scripts

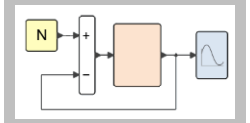
OpenMatrix

MODELICA

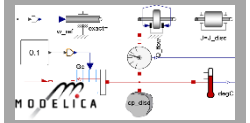
python

spice

Signal blocks

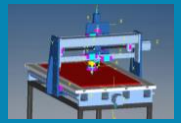


Physical components



Electrics/ Electronics

Multibody Dynamics



Electro-magnetics

Standards

0D

1D

3D

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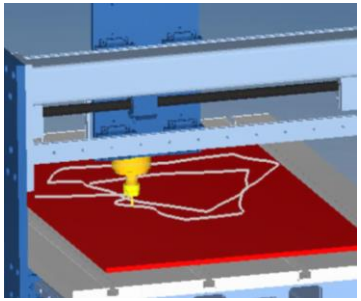
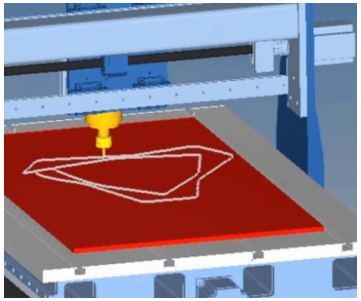
Motivation & outline

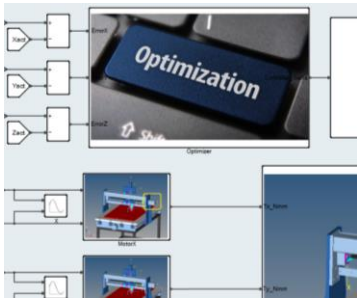
Ensure precision while increasing performance



Why
Missing accuracy & performance



What
Comprehensive system understanding



How
Holistic system model
Co-simulation allows Optimization

- Increase the precision with optimal parameter setting
- Comprehensive system view required for better system understanding
- Co-simulation of machine in a multi-body representation and controller including drives with optimizer on top for parameter identification

More accurate plant models lead to better controller designs.

This leads to better performance of the overall system.

(*plant model = is control engineer lingo to describe the physical system to be controlled)

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EVIDENCE

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MX3D
ABB

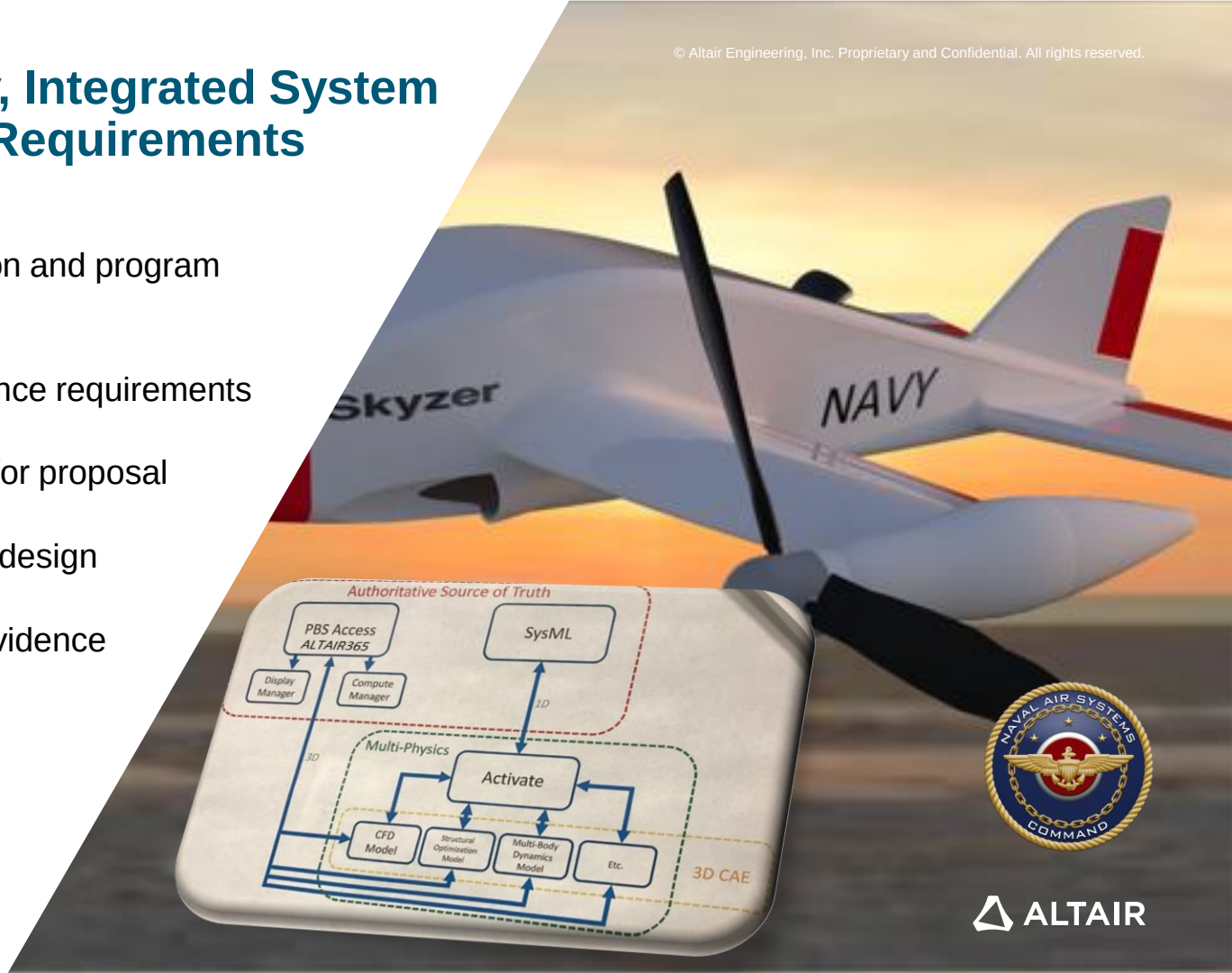
Large scale 3D Printing and Digital Twin technologies to the factory floor

- Improve structural efficiency due to 50% weight reduction
- Agile production of complex components in a few days
- Reduce operational risks through plannable commissioning
- Improve operational efficiency for high dynamic and heavy loaded equipment

Automation of Digital Processes in Product Development

Multi-disciplinary, Integrated System Simulation from Requirements

- Model based acquisition and program execution
- Meet vehicle performance requirements
- Respond to a request for proposal
- Preliminary air vehicle design
- Provide Engineering evidence



SUMMARY

From Development Silos

Slowing down innovation

- Disconnected Artefacts
- Incomplete view towards overall systems
- Error-prone, late, expensive
- ...

To Collaborative Engineering

Empowering innovation

- Purpose-driven model fidelity
- Based on a single source of truth
- Frictionless connections in use of standardized interfaces

THANK YOU

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#ONLYFORWARD

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