Was braucht es, um Simulationsabläufe mittels Web-Apps für jeden bereitzustellen

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/ Senior Product Sales Manager / Overlay Sales for Ansys optiSLang

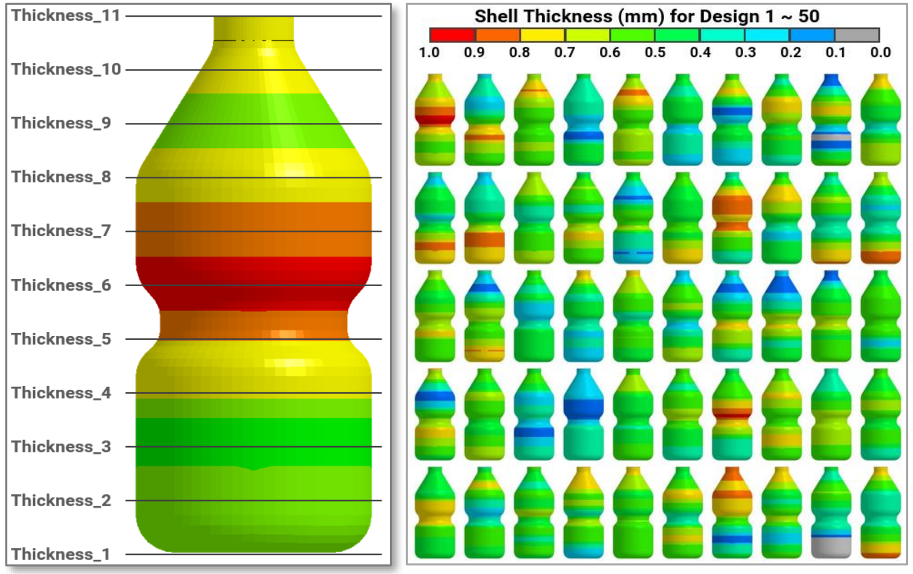
/ CADFEM Ansys Simulation Conference

Rapperswil 2023

Ansys

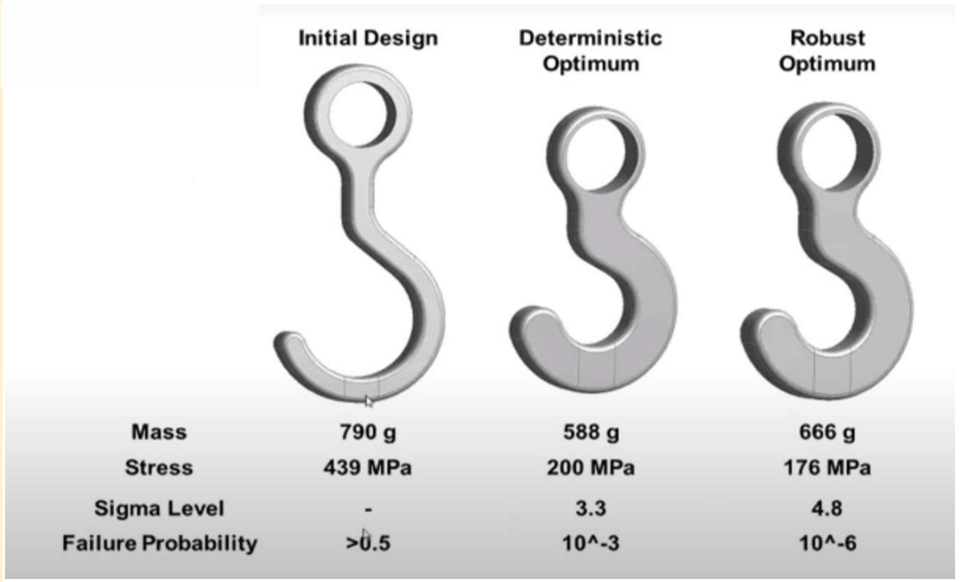
What is my optimal design? examples

Which thicknesses are important?



11 thickness inputs, 50 combinations

How to reduce the weight ?

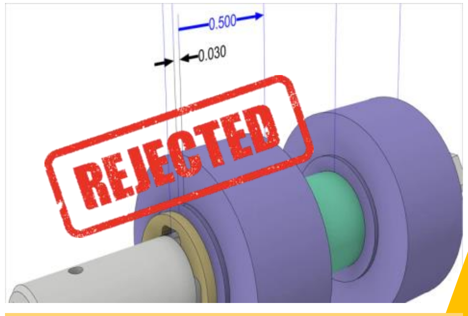


Minimizing Stress Level
Decreasing Failure Probability

Significant Challenges Exist To Optimize Multi-Physics Design with Simulation

Manual, Discontinuous Process

Conflicting Design Requirements



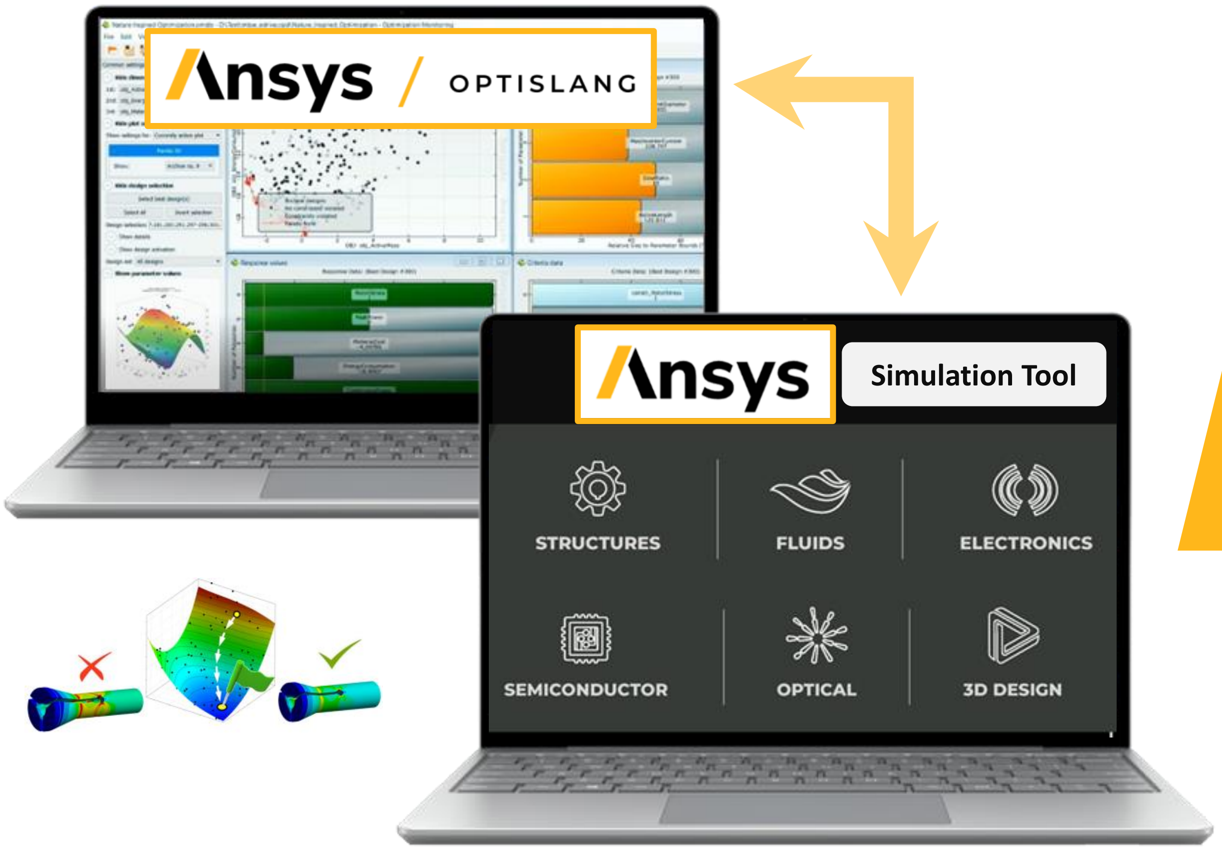
Poor Quality, Narrow Tolerances

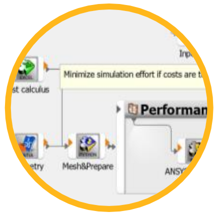
Typical Applications

- Optimization of a Toyota Prius Hybrid-Electric Motor
- Lightweighting Ariane6 Space Launcher Engine Panel
- Calibration of IGBT Spice Model

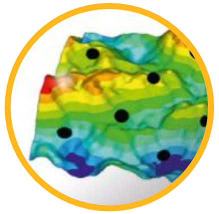
What is Ansys optiSLang ?

Ansys optiSLang is a framework used for **Robust Design Optimization** used in combination with physics-based simulations to optimize product designs





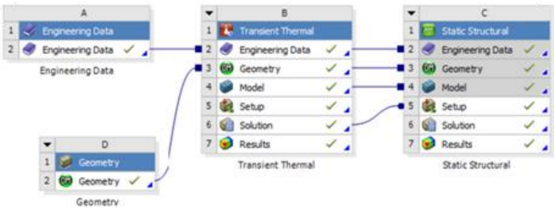
Process Integration
Build and Automate Simulation Workflows

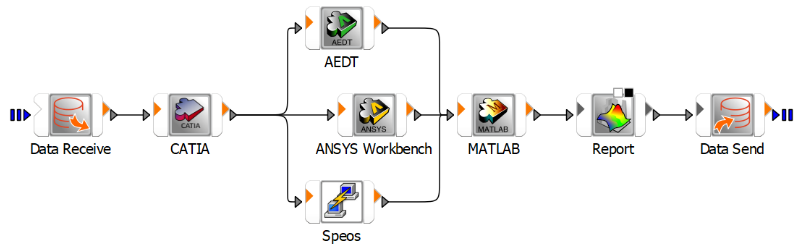


Design Optimization
Use Algorithms for Parametric Variation Analysis

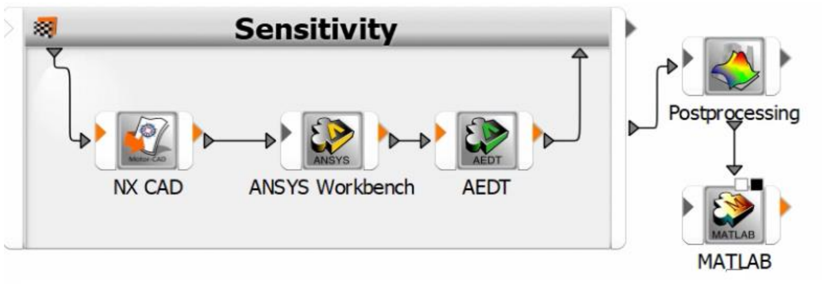
optiSLang: single physics to enterprise simulation democratization

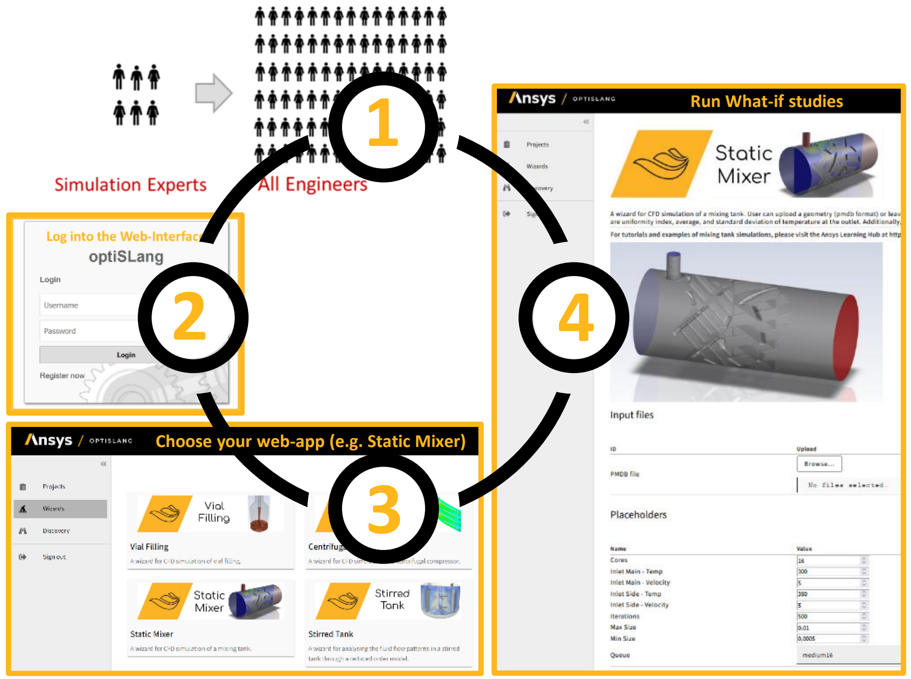
Capture Multiphysics and Systems	Connect and automate workflows with Ansys and other vendors	Deploy simulations across the enterprise
- Industry leading multi-physics & systems offerings - Vendor neutral, all solvers - Simulation and Measurement	- Simulation automation - Design Exploration & Optimization incl. AI/ML algorithms and models - Robustness / Tolerances Analysis	- Publish workflows with web-apps - Don’t think about licenses, installation, resources → easy to use with custom GUIs - Incl. Non-Simulation Experts into projects





Workflows & Variation Analysis

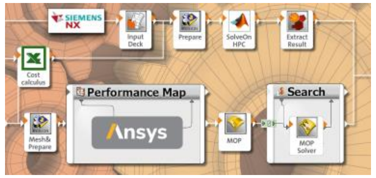




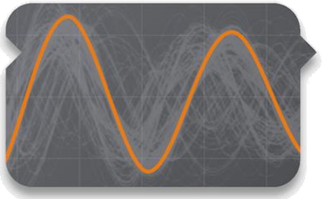
Process Integration and Design Optimization

Automation → Parametric Variation Analysis → Democratization

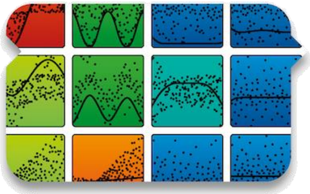
Automated Workflows	Model Calibration	Sensitivity Design Understanding	Optimization Design Improvement	Robustness Design Quality	Publish as web apps



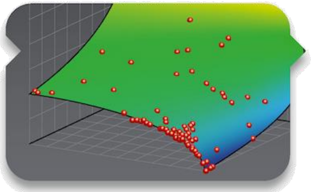
Easy to build and publish repetitive workflows



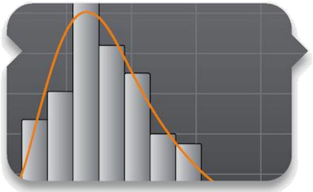
Identify important model parameter for the best fit between simulation and measurement



Investigate parameter sensitivities, reduce complexity and generate best possible metamodels



Optimize design performance



Ensure design robustness and reliability

Entire organization benefits from workflows provided by CAE-experts

Examples of Browser-Based Apps for Simulation Workflows

Ansys

Multi-Physics-Workflow with optiSLang and Mixing applications

Engineering Goals

- Enable more engineers to run standard CFD analysis
- Make it more stable, less manual and even flexible
- Overcome the problem of complex IT configuration for each user

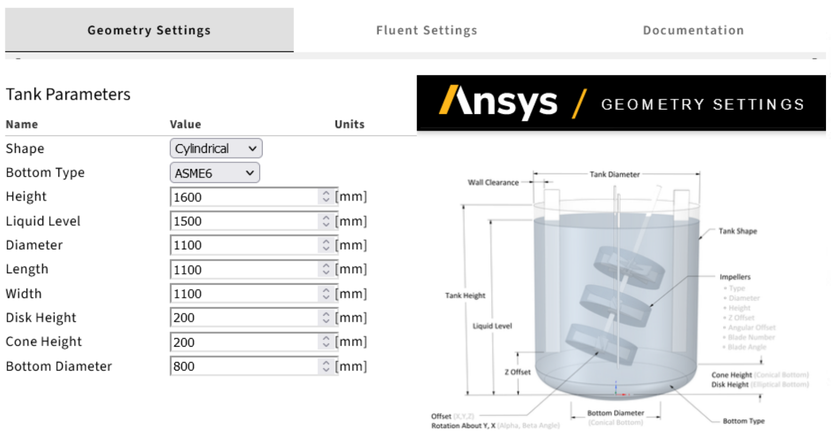
Ansys Solution

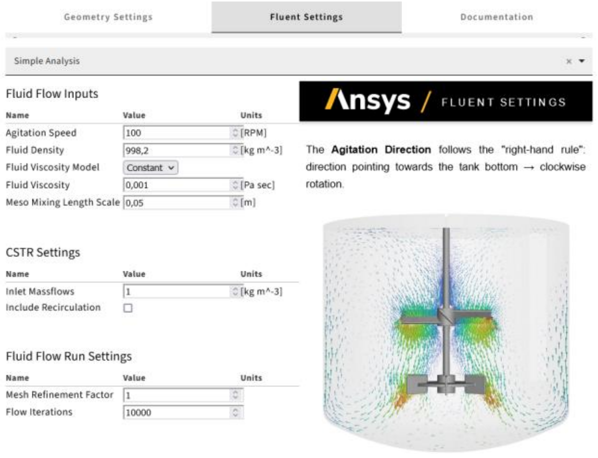
- Parametrized geometry & mesh creation in SpaceClaim & Fluent meshing
- Parameter & Journal driven Fluent runs
- Automated simulation workflow is driven by optiSLang
- Easy to use web frontend customized by python
- Auto-generated HTML report with all needed pictures, graphs, videos, and values

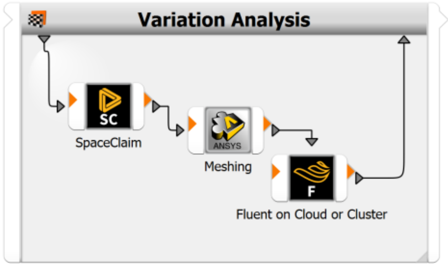
Benefits

- No local installation needed
- Use multiply queues to submit to cloud or company cluster
- User-friendly web frontend
- Faster product development
- Easy to switch from hardware tests to digital/virtual tests

Web frontend for democratization of CFD mixing applications in stirring tanks

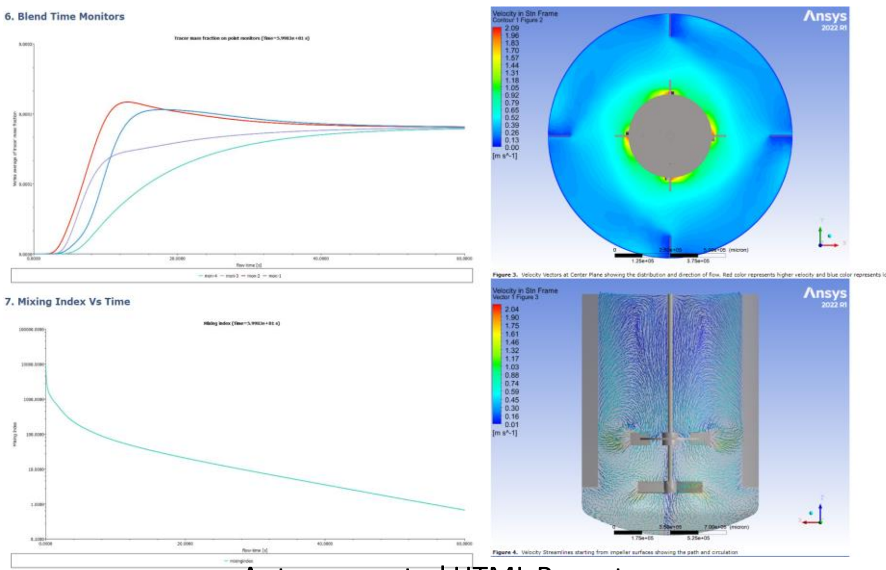






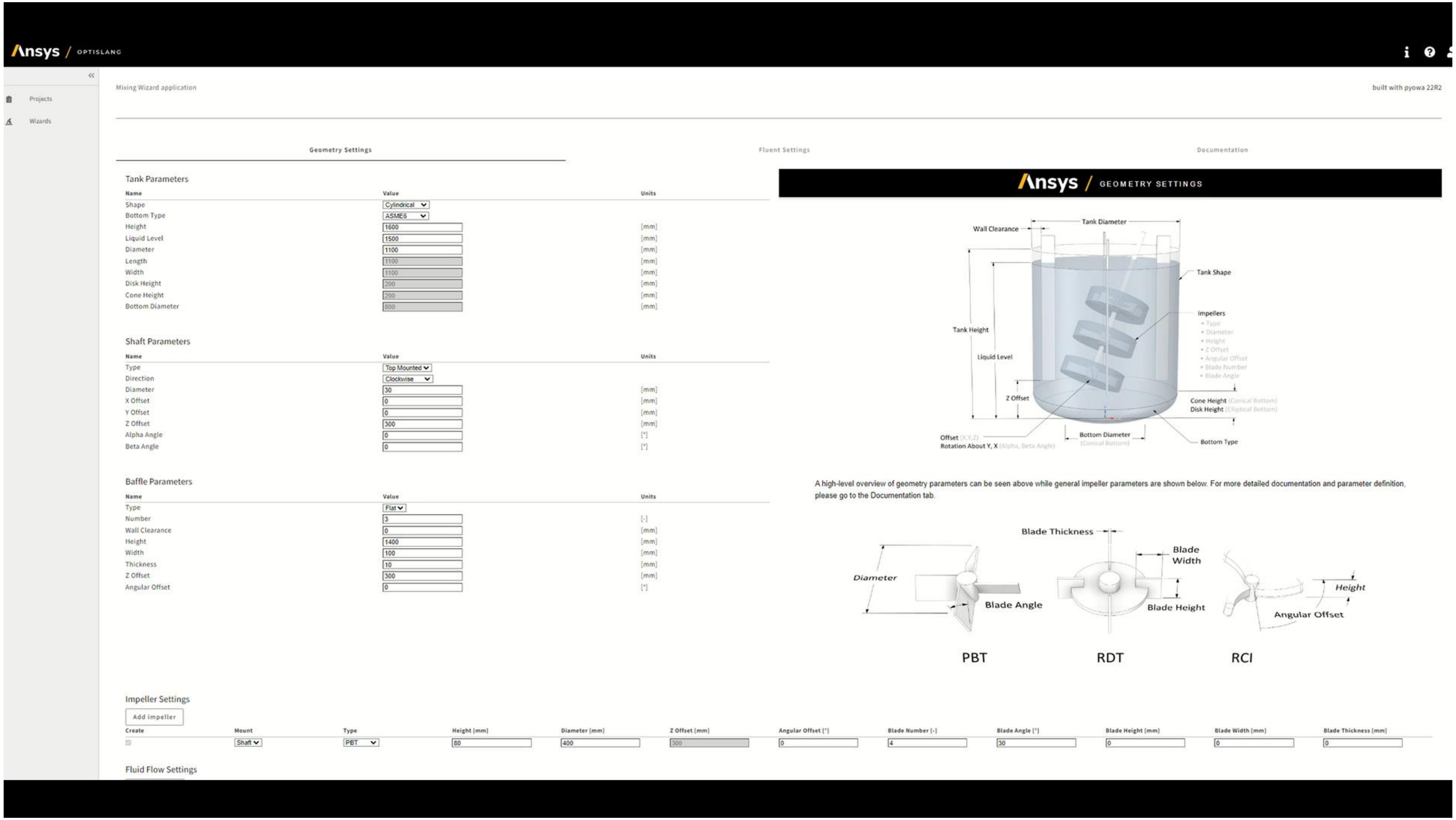
Automated CFD workflow in optiSLang

Mesh Refinement Factor = 1   Mesh Refinement Factor = 0.25



Auto-generated HTML Report

Multi-Physics-Workflow with optiSLang and Mixing applications



Simulation-based Design for increased reliability requirements

Customer Goals

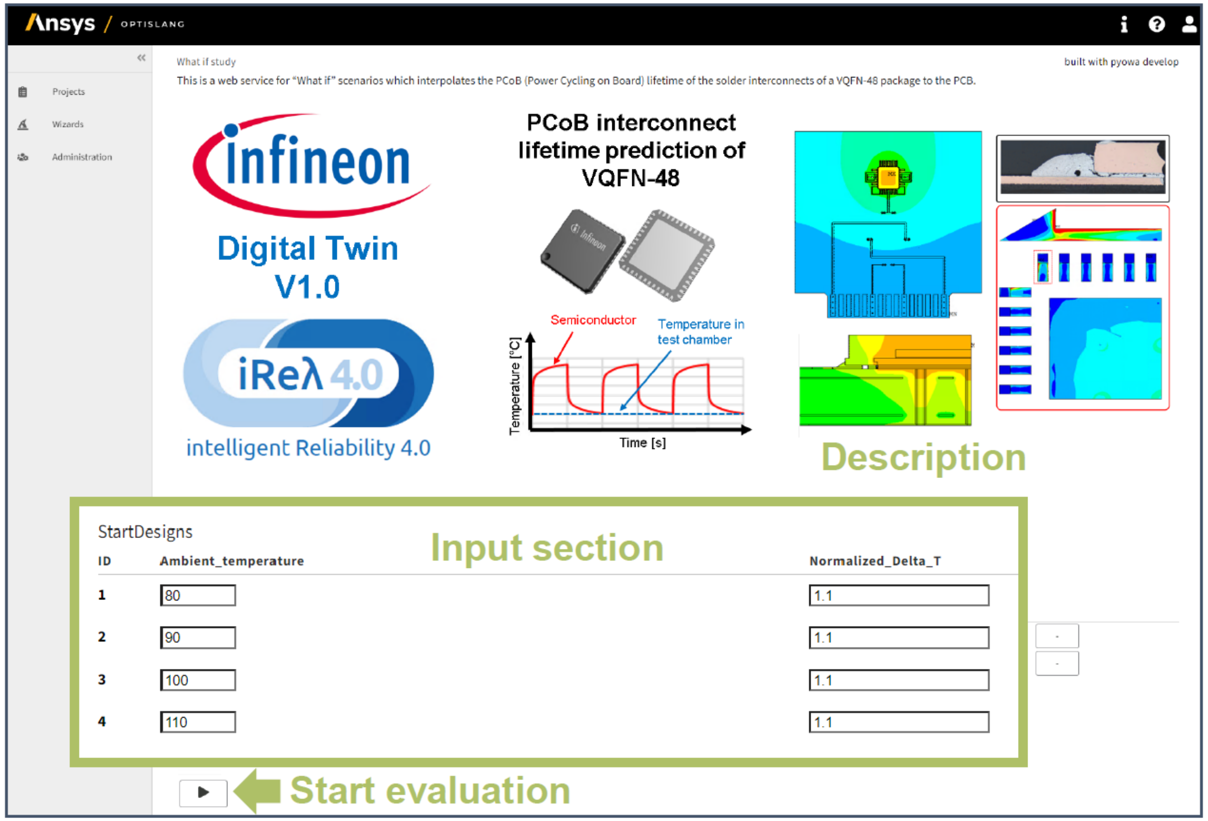
- AEC-Q100 Grade 0 will not cover the today extended requirements for solder joint reliability
- Simulation-based Design for Reliability is needed
- Fast assessments of components are needed for reliability experts

Solution

- Simulation based digital prototype is an alternative to analytical models
- Created digital prototype published via web service for global usage

Benefit

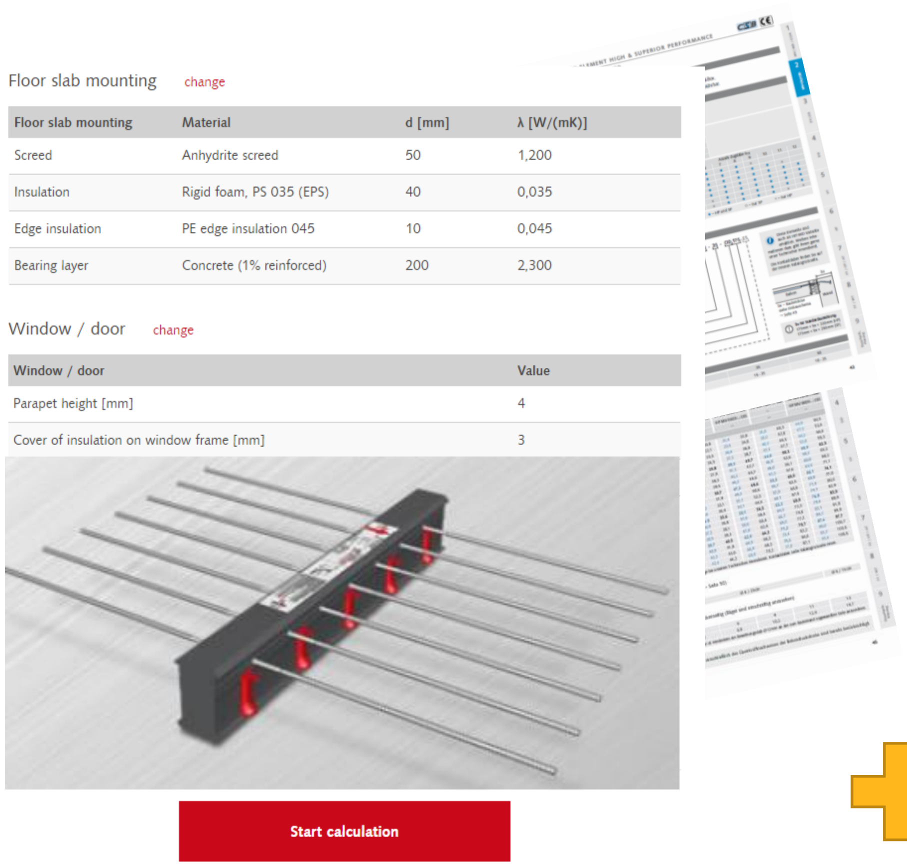
- Prediction on digital prototype takes only few seconds
- Additional visualization of local prediction quality increases acceptance
- Web service does allow non-simulation-experts to consume simulations immediately

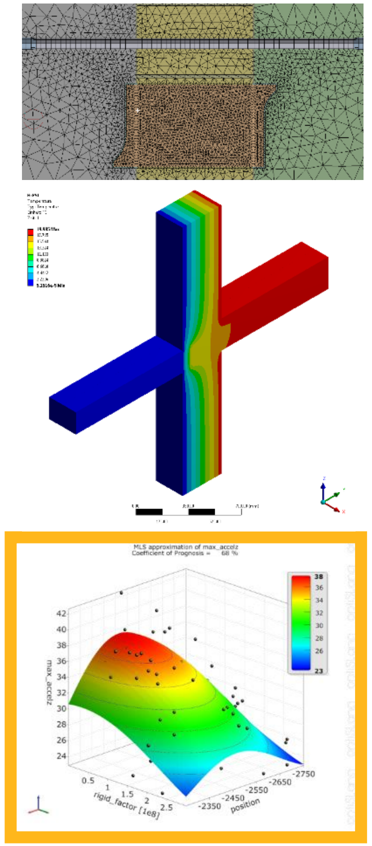


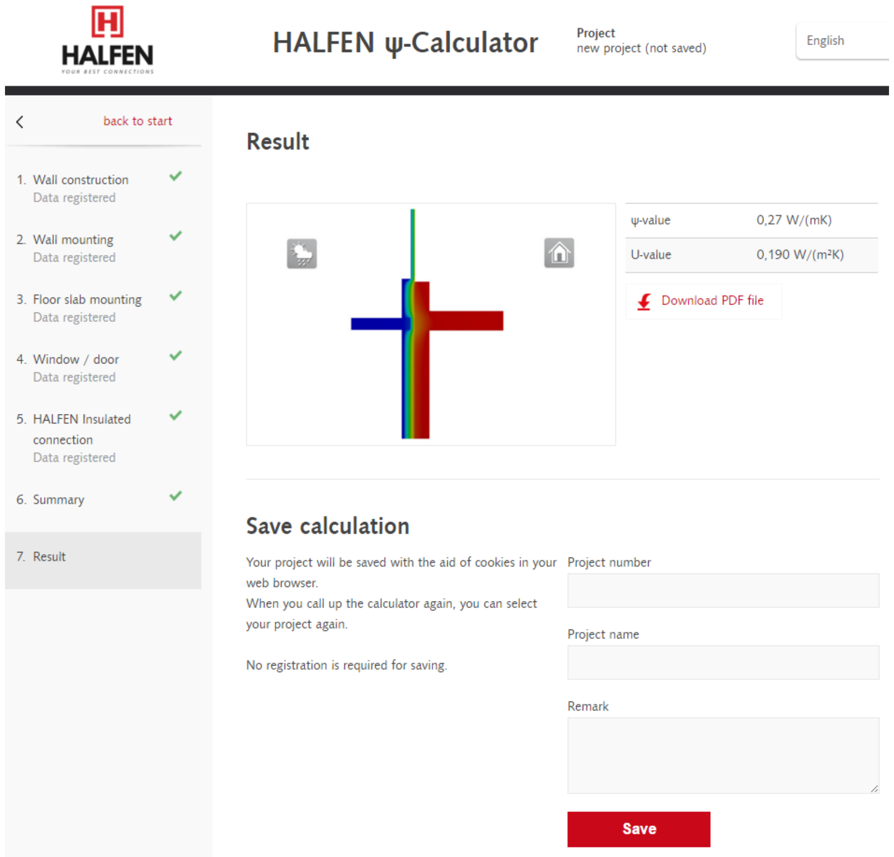
Martin Niessner, Provision of MOPs via web-apps for the rapid assessment of solder joint reliability, WOST Workshop 2022

“What if” studies for end-customer usage

- Combining static product catalog with the simulation knowledge base and creating a Product Twin
- Answer on demand → increase market share → better brand







Thorsten Heidolf, Use of metamodels for web-based calculation of thermal bridge parameters, WOST Workshop 2022

https://psi.halfen.com/de-de/start

Modular Simulation Workflow for E-Motor Development

Customer Goals

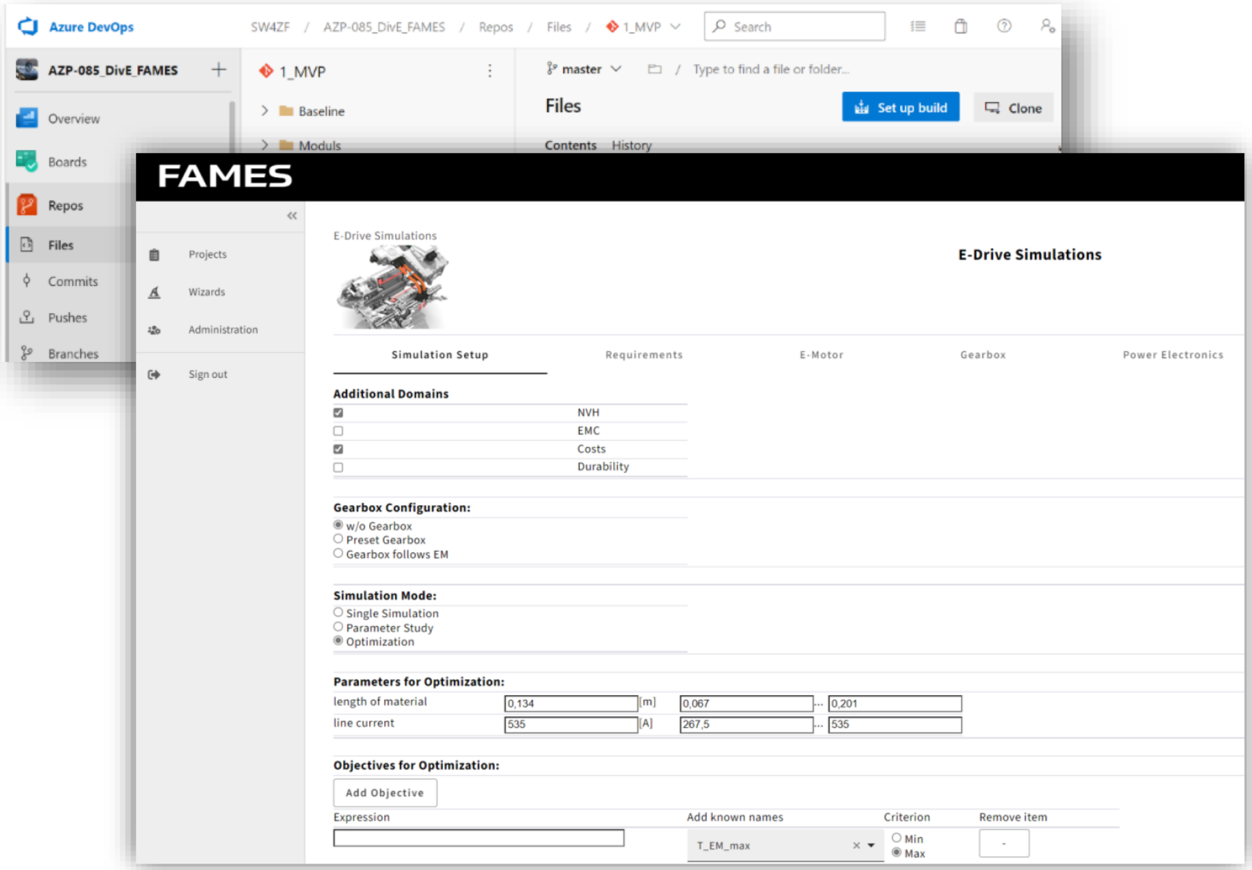
- Modular way to connect any solvers to workflows
- Non-simulation experts should be able to create workflows

Solution

- Vendor-neutral simulation platform to connect any Ansys and inhouse-tools
- Web service with guided frontend for help to create workflows

Benefits

- Reducing costs because also non-expert can build advanced workflows
- Increase efficiency because everybody, every time, everywhere workflows can build
- Speed-up development time



Helmut Schmid, Webservice based Framework for Automated Modular Electric Drivetrain Simulation, WOST Workshop 2022

Web App for AI/ML-driven Intelligent Product Design

Engineering Goals

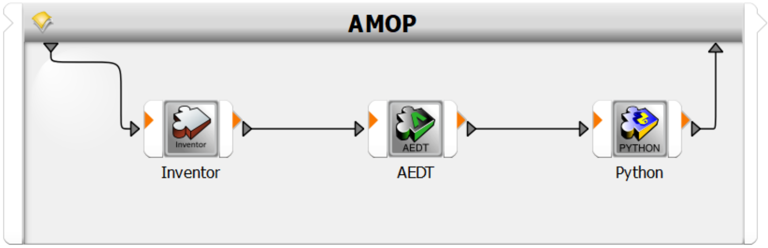
- Develop a platform for **fast** (close to real-time) and easy **design generation & optimization** of product lines
- **Enable non-CAE expert** users with high-fidelity analysis and simulation-driven design optimization.
- **Reduce** overall development time and cost

Ansys Solution

- **Automated surrogate model extraction:** orchestrating different tools for analysis & design space exploration; real-time approximation and design visualization (*HFSS, optiSLang, Minerva*)
- **Large-scale optimization**: DoE (Design of Experience) study through all possible parameter combinations of the simulation (*optiSLang*)
- **Governance:** maintaining the digital thread throughout the development process (optiSLang, Minerva)
- **Customization**: platform customization through Ansys Prof. Service

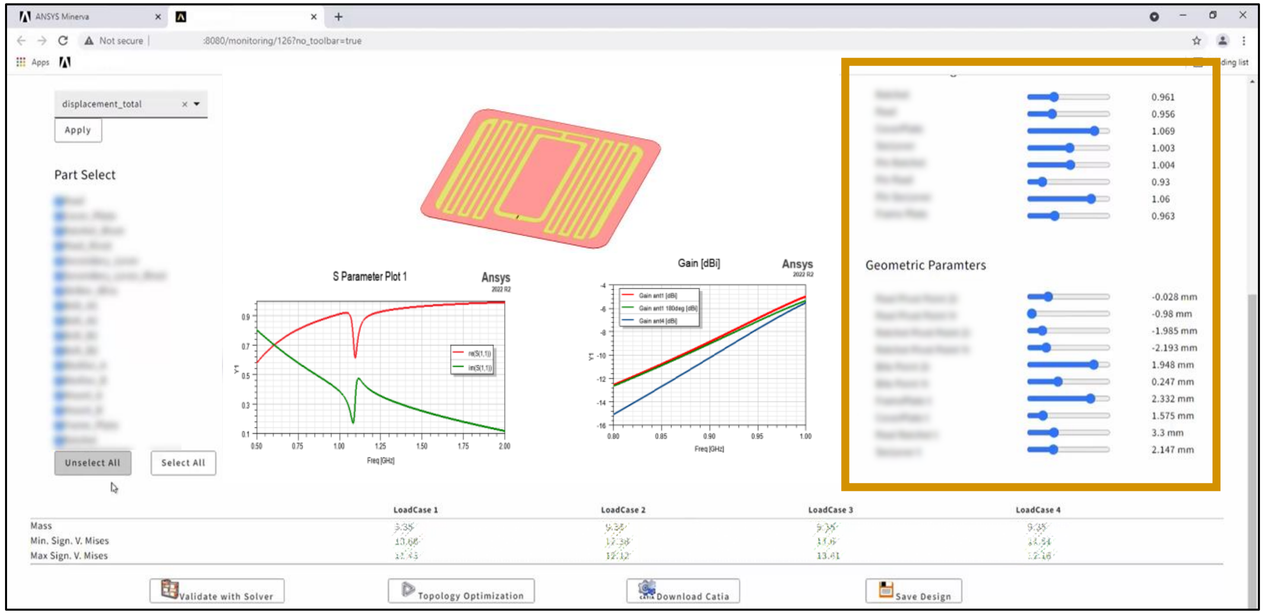
Benefits

- **Improve cross-BU collaborations** & **reduced requests for proposals (RFP) turnaround** thanks to real-time design space exploration
- Enable **digital continuity** of CAE models throughout the product development process, significantly lowered the risk of lost Request for Quote (RFQs) & wasted engineering time/labor



75% reduction development time

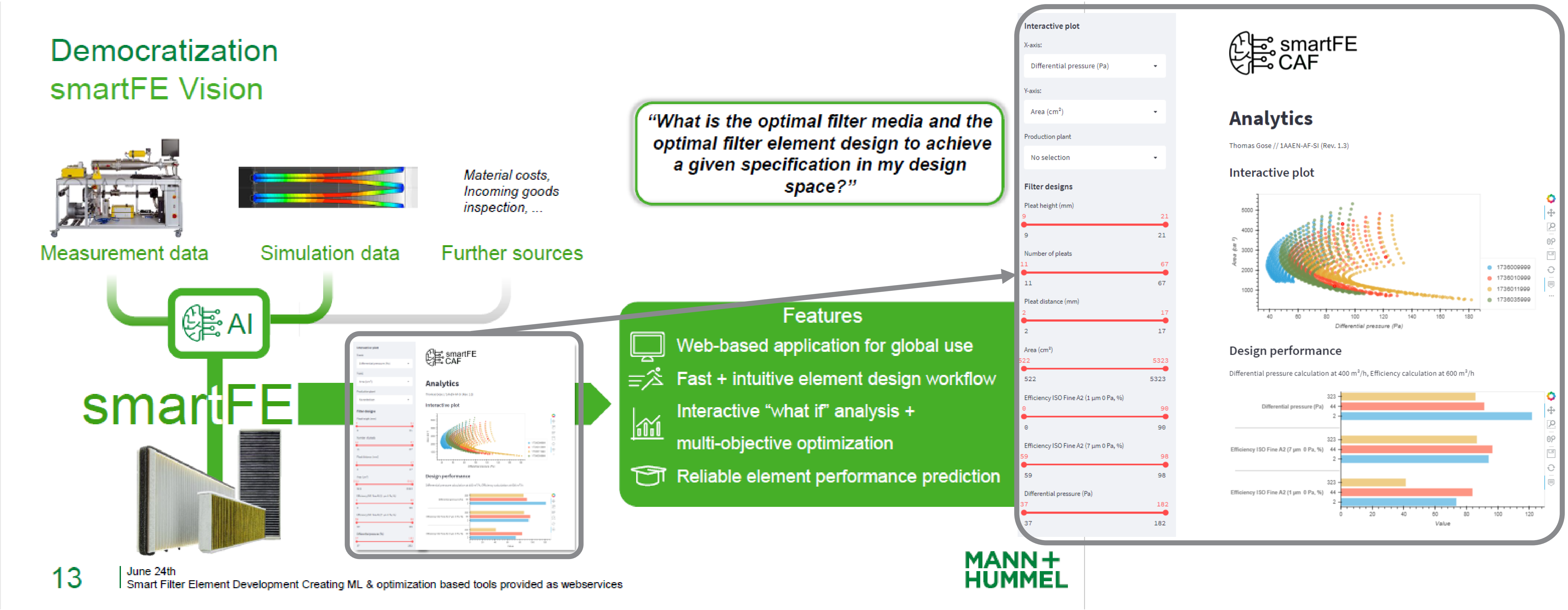
Automated Workflow inside Ansys optiSLang to run several 100s of designs to train ROMs



Online Platform for real-time design variation of RFID Tags

Democratize with Web Apps as Smart Filter Design Toolbox

- Democratization helps to parametrize, analyze and decide during development
- Connecting measurements and Simulation data, Browser-Based visualization for non-CAE-user



Thomas Gose, Christoph Schulz, Smart Filter Element Development – Creating ML & optimization based tools provided as webservices, WOST Workshop 2022

Ansys

What is needed to create a browser-based app?

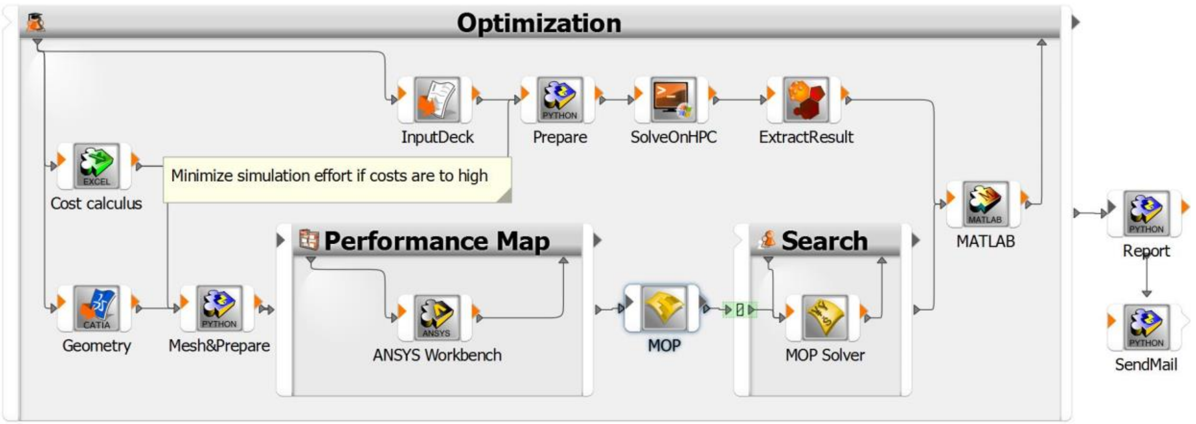
Process Integration is Used to Automate Simulation Workflows

Ansys Solvers

External Tools

Custom Codes

Simultaneous HPC execution



OPTISLANG

Simulation Automation Platform

Connect

Ansys tools, Inhouse Codes, 150+ commercial solutions

Orchestrate

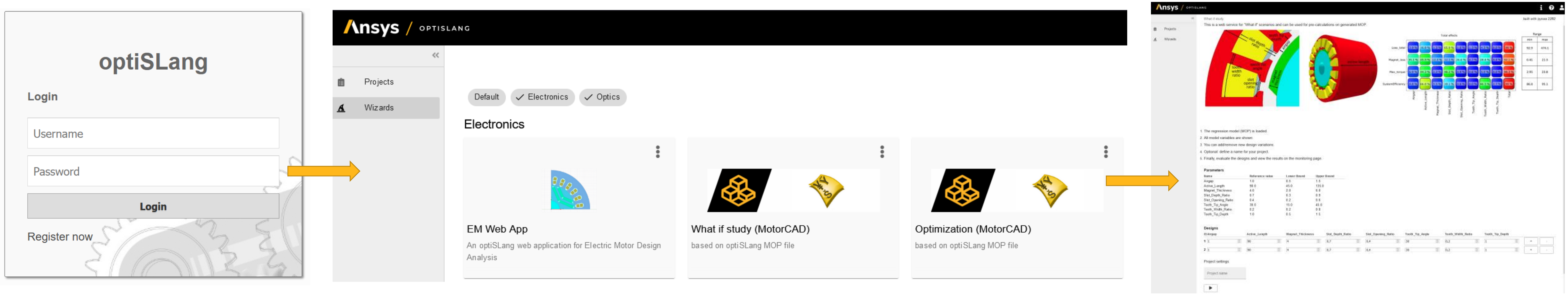
Set sequences, branches, conditions, loops, combination of algorithms

Publish

Packaged Apps for Non Simulation experts

Steps to democratize your simulation workflow

- Build the optiSLang workflow you want to publish (with CAD + Solver or ROM usage), define in the workflow where each part should be executed (Local/Cluster/Cloud)
- Define “placeholders” for parameter access via the app
- Define “registered files” for postprocessing of results in the app or new input files
- Create the GUI of the app with py-based modules (templates)
- Define a workstation in your company as a basis for the web-server
- Give all users of the app access to the IP address of that web-server



Ansys optiSLang capabilities - Summary

Process Integration
Build, Orchestrate and Publish

Tools Connection & Solver-neutral
Support Ansys & 3rd Party Tools

Simulate More Automatically
Build Automated Workflows

Simulation for Non-Sim Experts
Publish Workflows as web apps

Digital Transformation
ROMs for Digital Twin

&

Design Optimization
Use Algorithms for Parametric Variation Analysis

Reduce Complexity
Sensitivity Analysis

Find Reliable Optimum
Design Optimization

Verify Design Quality
Robustness Evaluation

Fit Simulation & Measurement
Model Calibration

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For more information or a demo please contact:

CADFEM – The Ansys Elite Channel Partner

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