

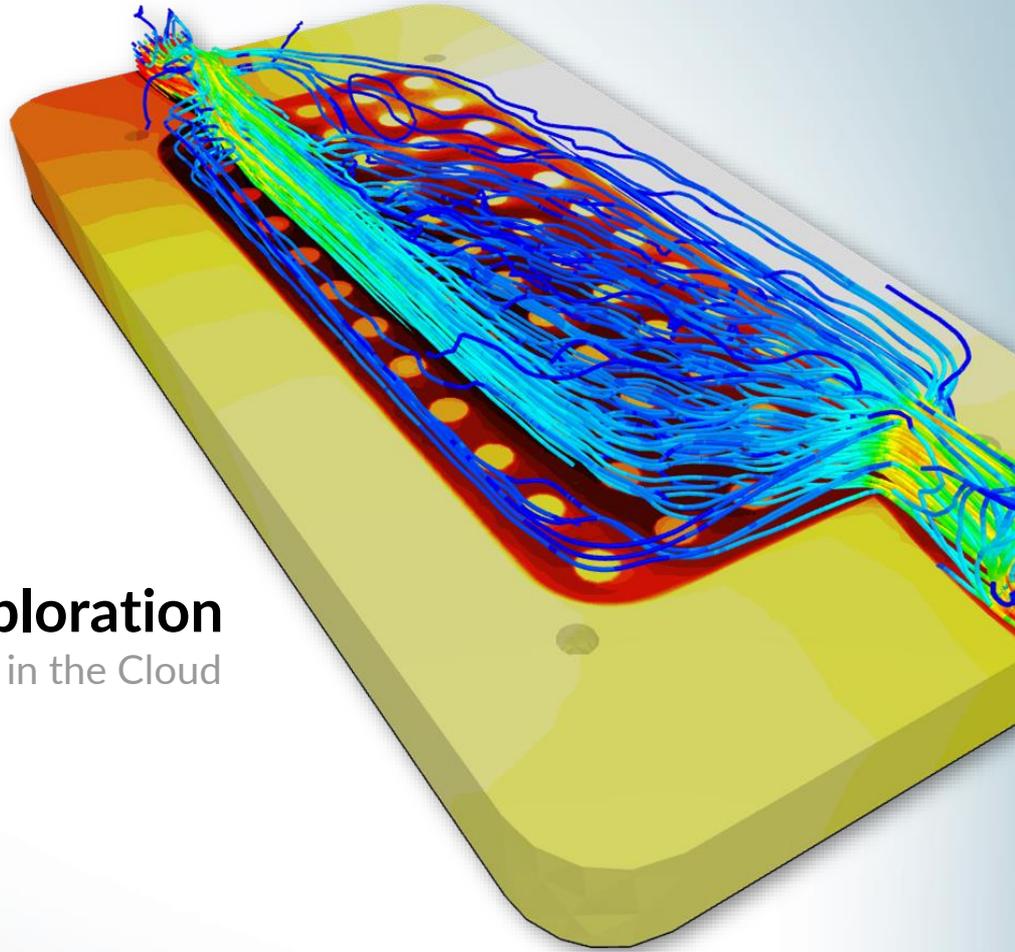
Datadvance User Conference 2021

"Serverless" Design Space Exploration

End-to-end Shape Optimization Completely in the Cloud



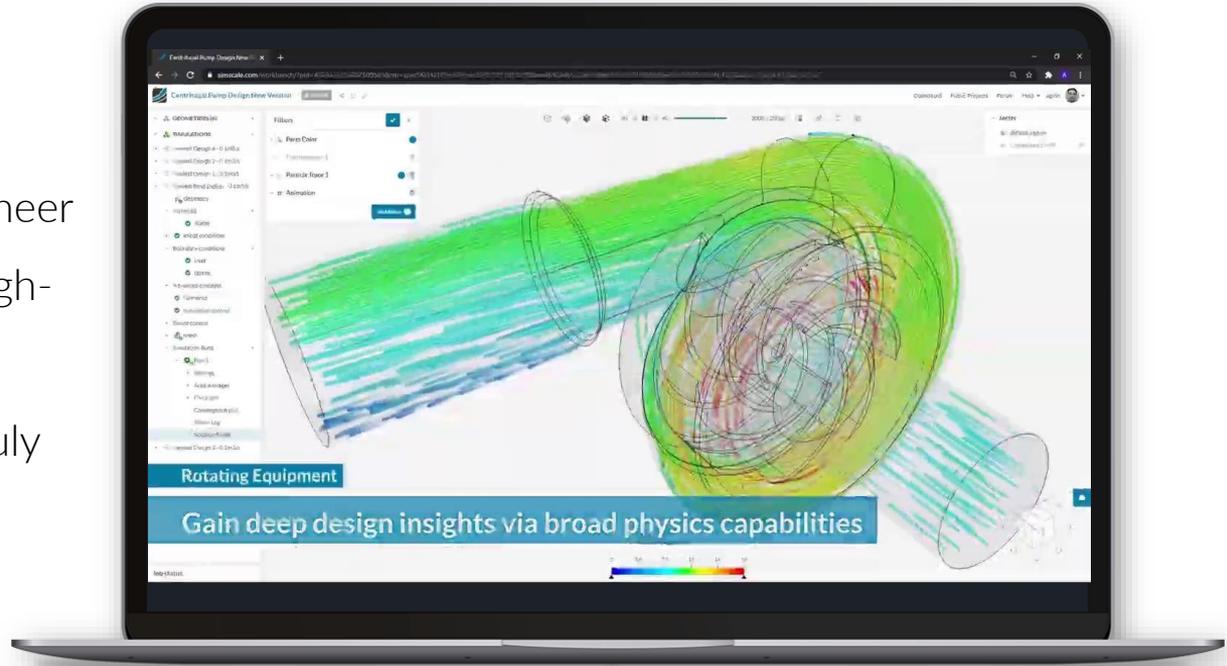
David Heiny
Co-Founder & CEO



About Us

We empower every engineer to innovate faster

SimScale empowers every engineer to innovate faster by making high-fidelity engineering simulation technically and economically truly accessible at any scale.



Whom we work with

Thousands of engineering organizations are using SimScale



Selection of Customer Organizations

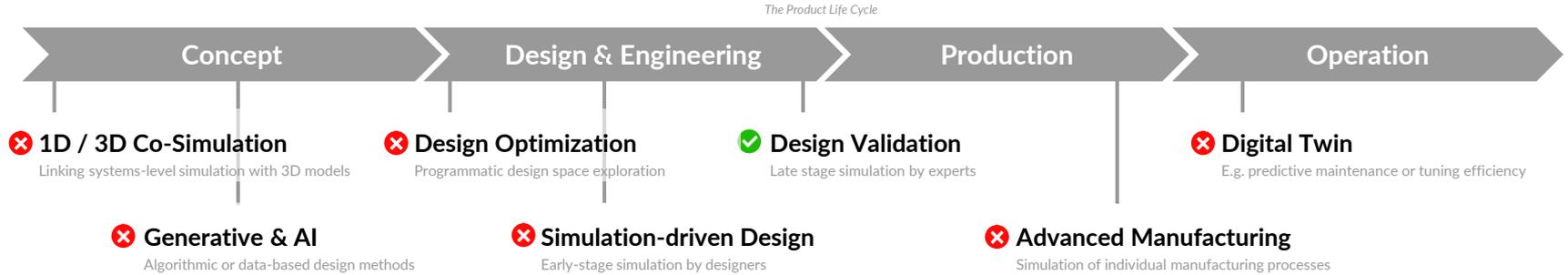


“The nice thing about SimScale is that you can essentially run an unlimited number of simulations simultaneously with no reduction in computational resources, because SimScale opens up each simulation on independent nodes. This is a huge advantage for us, because we are typically under heavy time constraints.”

Daryn Bertelson, CAE Engineer, Aqseptence Group

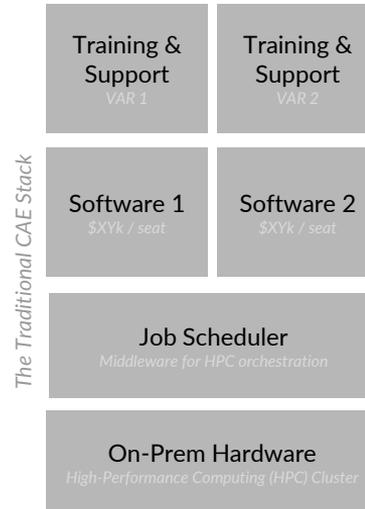
The problem we're solving

The traditional CAE software stack constraints simulation to validation



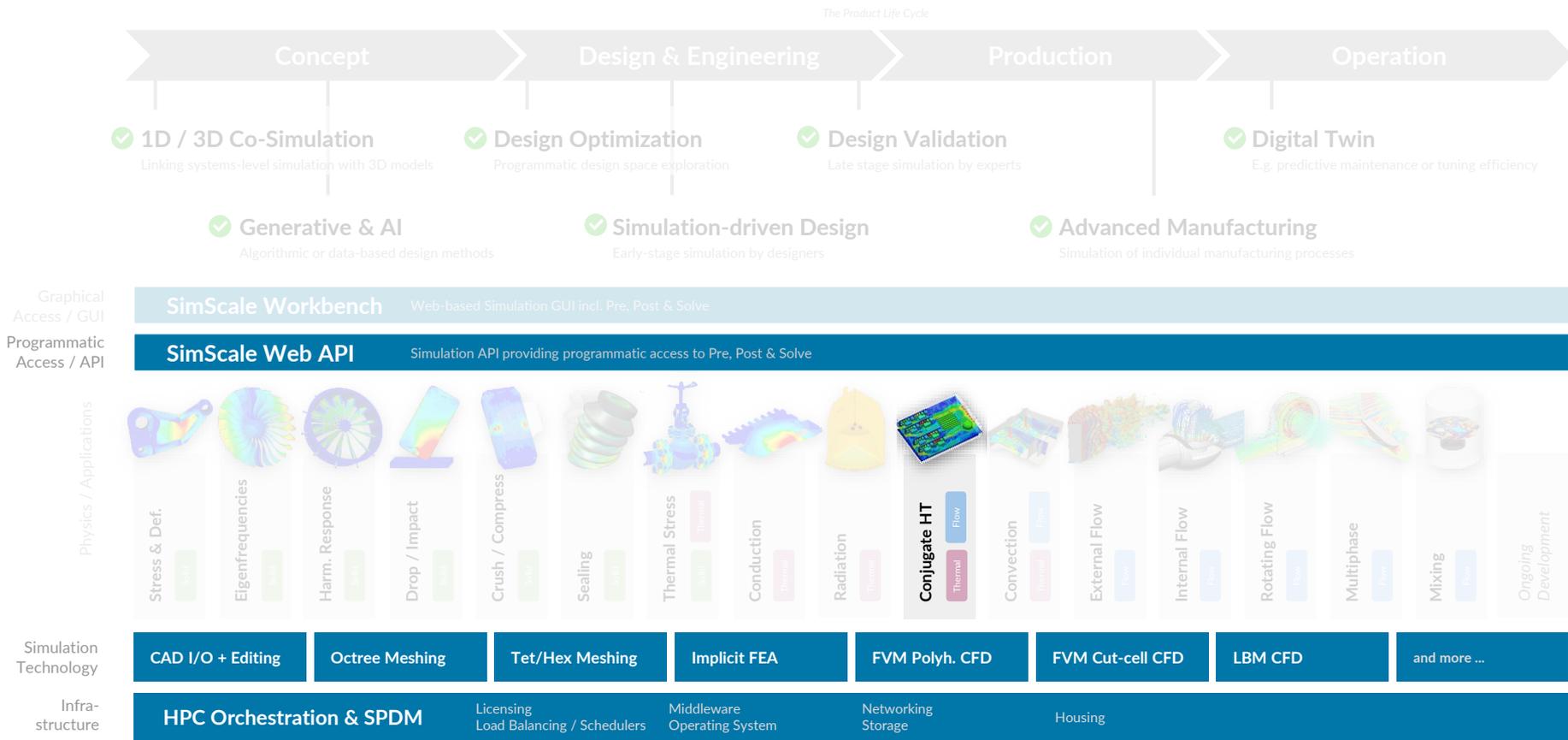
✗ Problems

- Hardware constraints
- License constraints
- Closed Ecosystems
- Governance issues
- Desktop centricity
- Learning curve



How we're doing it

Moving simulation from a point solution to a layer in the Enterprise IT Stack



IGBT Cold Plate - Optimization Problem Statement

Target Functions

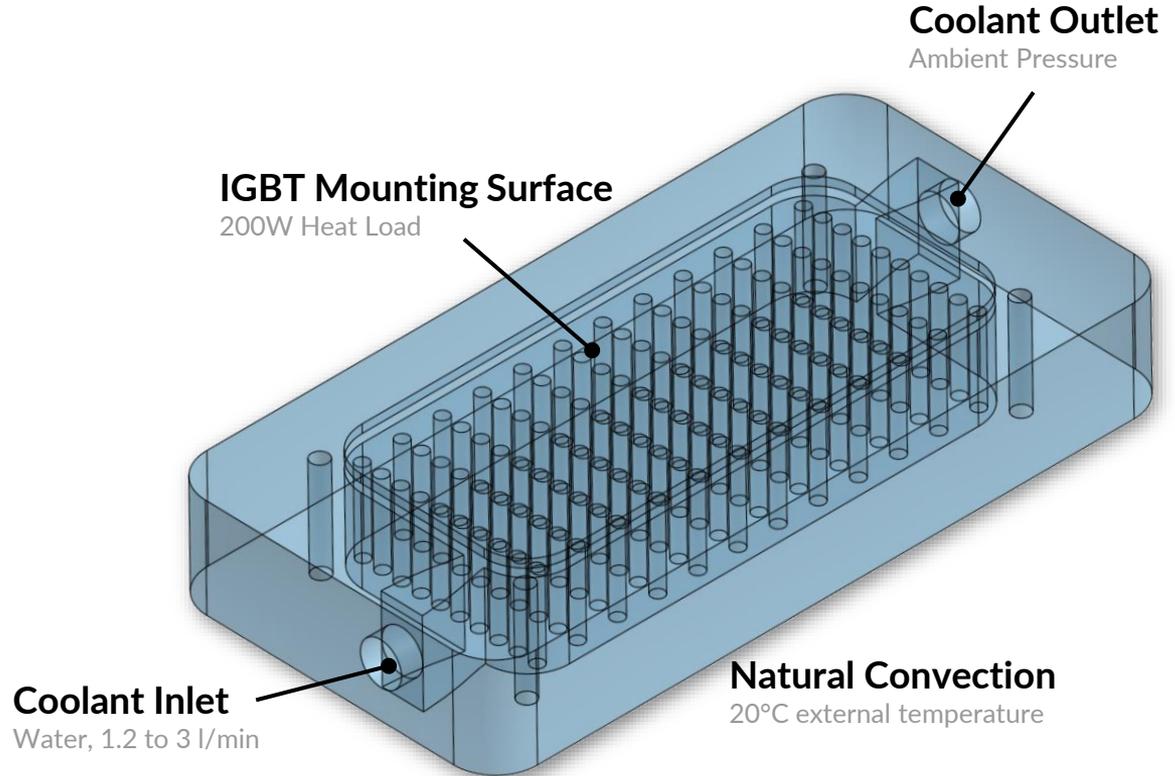
- Average Surface Temperature → Minimize
- Pressure Drop / Drag Power → Minimize

Variables (5 Parameters)

- Pin Diameter: [2; 6] mm
- Pin Row Offset: [0; 0.5] mm
- Pin Rows in X: 6, 7 or 8
- Pin rows in Y: 3, 4 or 5
- Flow rate: [1.2; 3] l/min

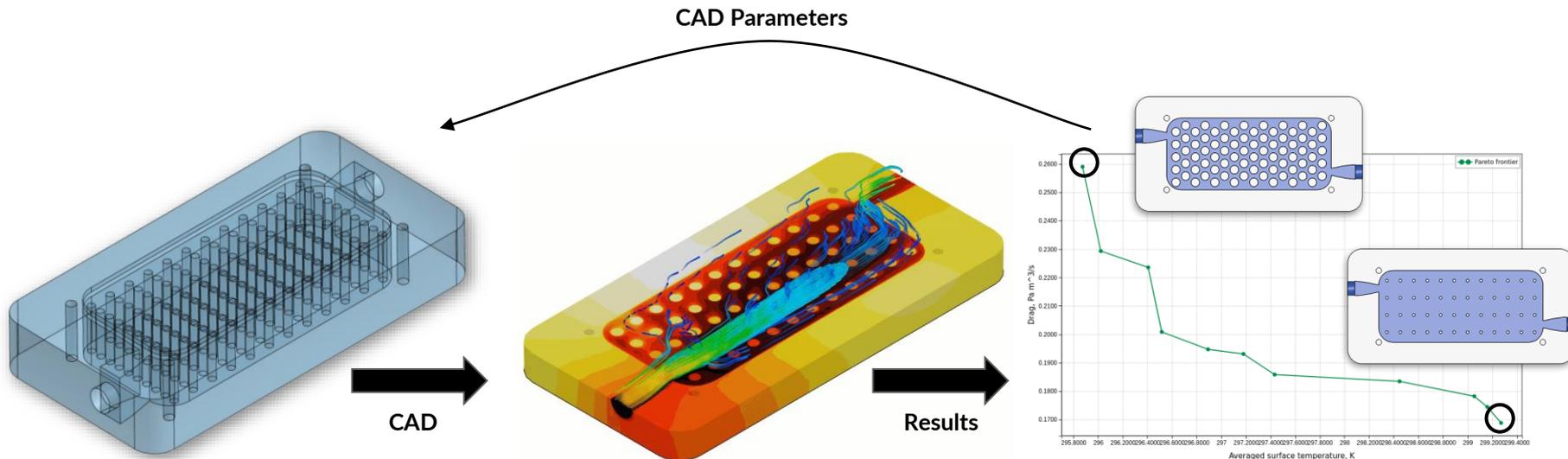
Fixed Values

Cooling Channel Depth: 15 mm



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End-to-end Shape Optimization - completely in the cloud



CAD - Onshape

Parameterized CAD model of IGBT cold plate, 5 geometric parameters



CAE - SimScale

Coupled convection + conduction analysis, extraction of relevant quantitative results



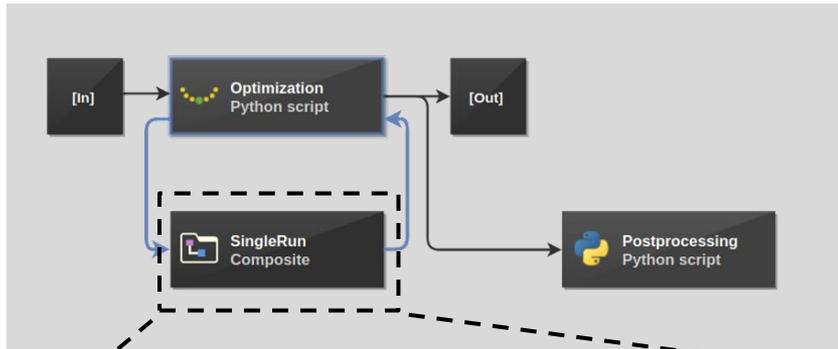
Optimization - pSeven

Surrogate-based optimization minimizing temperature and pressure drop

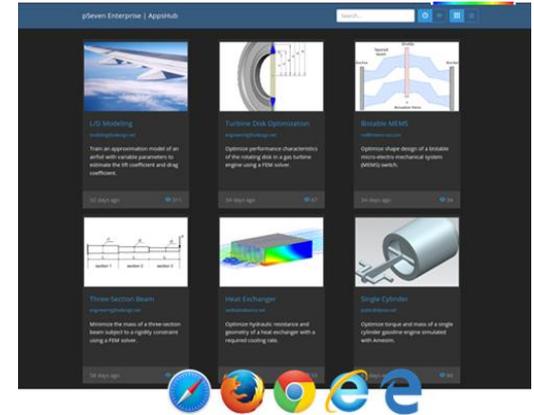
Cloud-Native out-of-the-box - Orchestrated via pSeven Enterprise Workflow

End-to-end Shape Optimization - completely in the cloud

Overall Setup



AppsHub Web Application



CAD + CAE Workflow - entirely cloud based

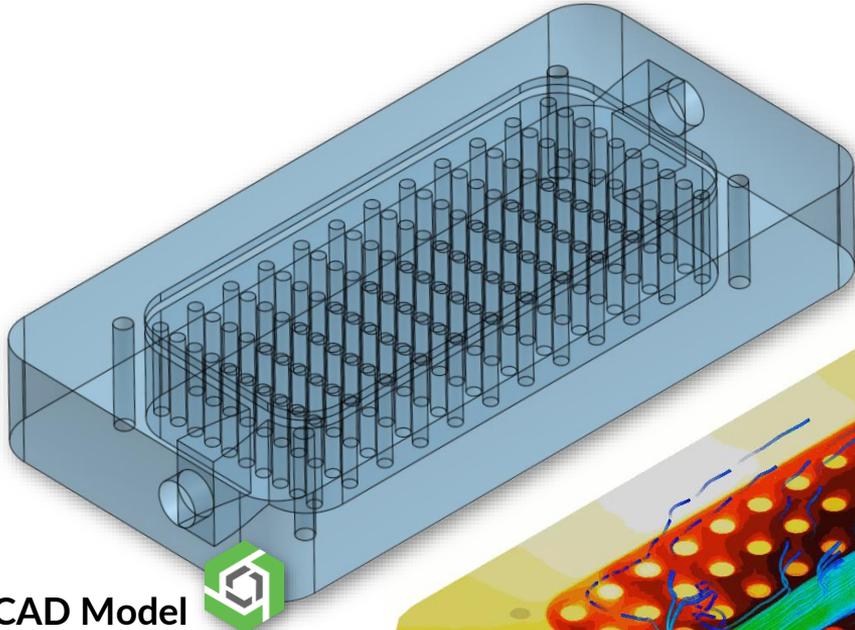
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Thank you!



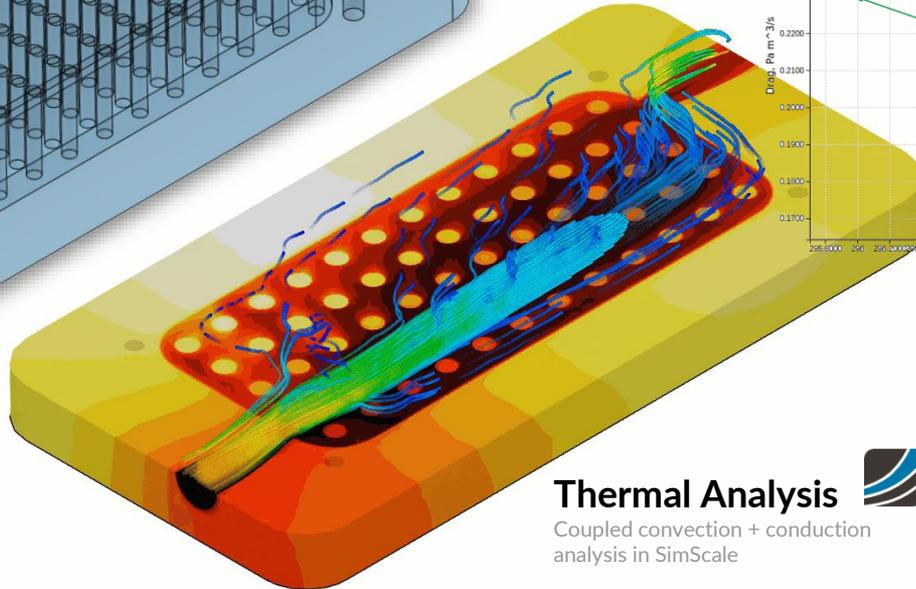
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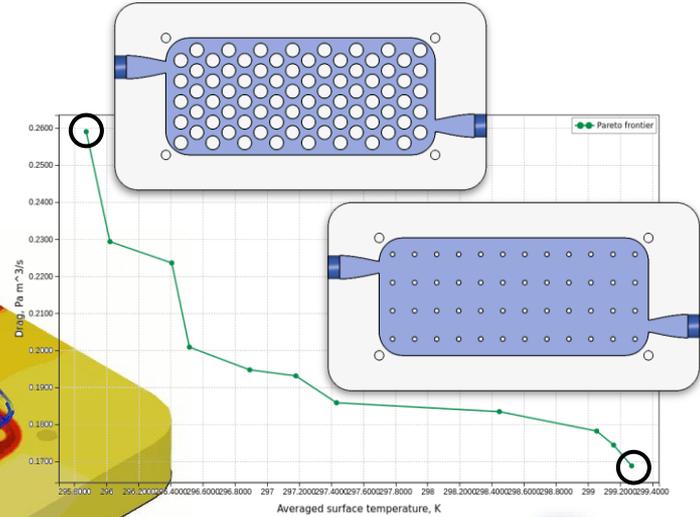
CAD Model

Parameterized CAD model in Onshape IGBT cold plate, 5 geometric parameters



Thermal Analysis

Coupled convection + conduction analysis in SimScale



Optimization Study

Surrogate-based optimization in pSeven, minimizing temperature and pressure drop

