



# UNLOCK INNOVATION

Accelerate product innovation by enhancing fluid and thermal performance in the early design phase

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# INTRODUCTION

## Quickly assess fluid flow and thermal performance to guide product design improvements, leveraging CAD- and PLM-embedded CFD.

A growing number of businesses are making physics-based simulation an integral part of their design process to create more innovative products, speed up their time-to-market and reduce overall costs.

This paradigm shift in product development processes can be realized only by integrating multiple disciplines in the product development process – including CAD, simulation and PLM.

**Fluid Dynamics Engineer** on the **3DEXPERIENCE** platform<sup>®</sup> allows designers and engineers to inspire innovative products with physics simulation-driven design exploration in the early development phase. Experts and non-experts alike can perform fluid flow and thermal transfer simulations using the guided user interface, so they can spend less time on simulation setup and focus on engineering.

### Inspire optimal product designs, fast

Leverage simulation-driven design to rapidly explore design alternatives in the early product development stages

Minimize expensive and time-consuming physical tests

Reduce design iterations and cut rework time and costs

Protect brand image and cut warranty costs by preventing product failures in the field

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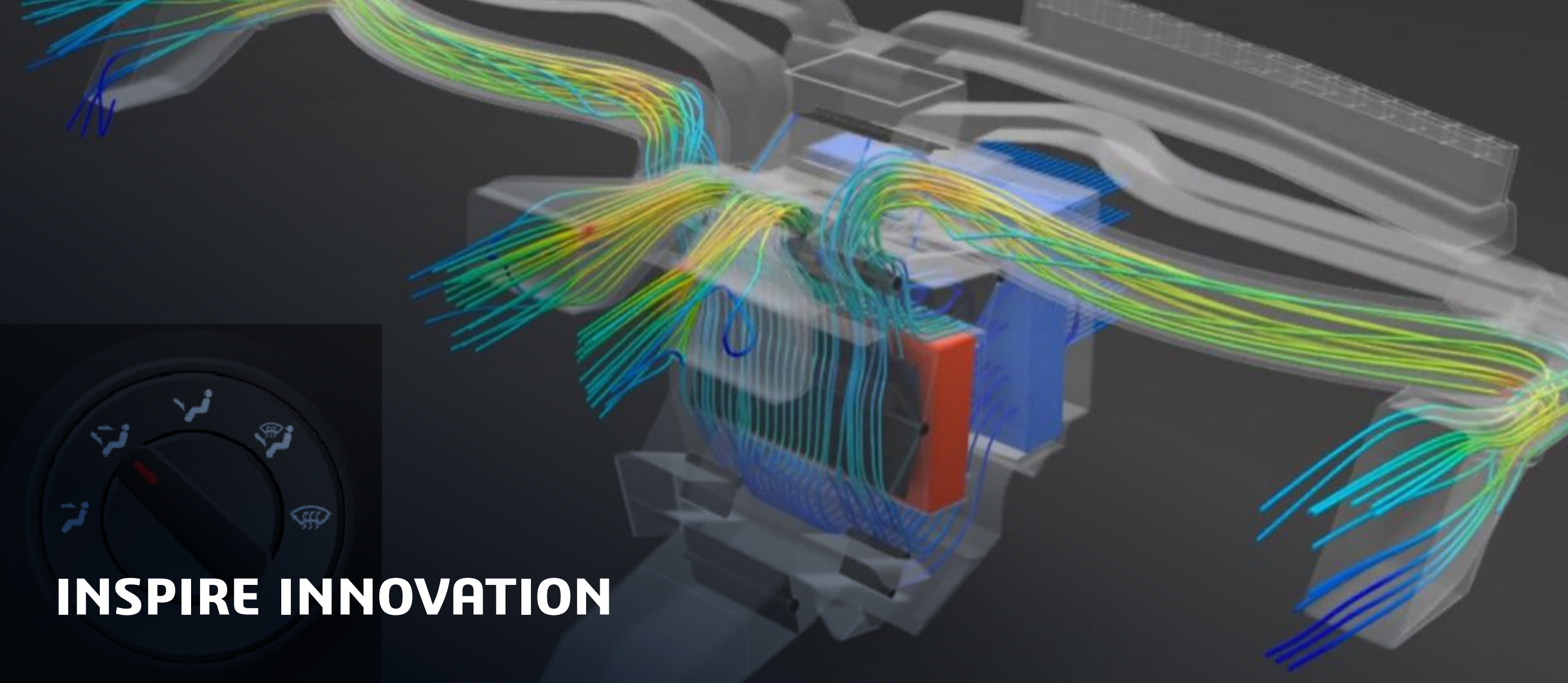
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## INSPIRE INNOVATION

In a typical design process for flow and thermal systems, designers or engineers create 3D models which are then sent to a specialist for CFD analysis and simulation. This typically takes several months, followed by physical testing.

Fluid Dynamics Engineer is tailored for engineers who perform routine fluid flow and conjugate heat transfer calculations to guide design improvements while exploring innovative design concepts.

It enables users to quickly explore hundreds of designs while concurrently improving product performance based on criteria such as optimal flow distribution, efficient thermal management, minimal pressure losses, flow uniformity or reduced recirculation.

The solution leverages industry standard RANS based finite volume Computational Fluid Dynamics (CFD) technology, with a fully guided user experience. This allows designers and engineers – even simulation novices – **to innovate simulation-driven designs**.

With Fluid Dynamics Engineer, simulation technologies are integrated with CAD and PLM, leveraging a single collaborative environment in the **3DEXPERIENCE** platform on the cloud for end-to-end product development. High-performance computing capabilities on the cloud generate powerful, fast performance that doesn't depend on local hardware resources.

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# ACCELERATE TIME-TO-MARKET

Innovation has never been more important. With a manual approach to design, the ability to innovate is limited based on experience – what you're familiar with and what you've done in the past.

Fluid Dynamics Engineer makes innovation faster and easier with a guided user interface, automatic fluid extraction and meshing, DOE and optimization studies, and a fully automated design exploration process.

The dedicated workflow guides users through the principal steps in a CFD and Conjugate Heat Transfer (CHT) simulation, so even novice users can set up and run simulations as needed.

Automatic fluid domain extraction makes it possible to reduce the complexity of internal fluid flow systems (pipes, valves and ducts) as well as external flows (buildings, vehicles). The automatic creation of a body-fitted hex-dominant mesh with boundary layers enables accurate CFD simulation concurrently addressing fluid flow and thermal transfer.

Stop relying on known designs and physically testing multiple design models thanks to automated design exploration. Pre-select a small number of optimized designs for analysis, and run hundreds or thousands of simulation scenarios to guide the design process. Make informed design decisions based on your criteria for quality, innovation and cost.

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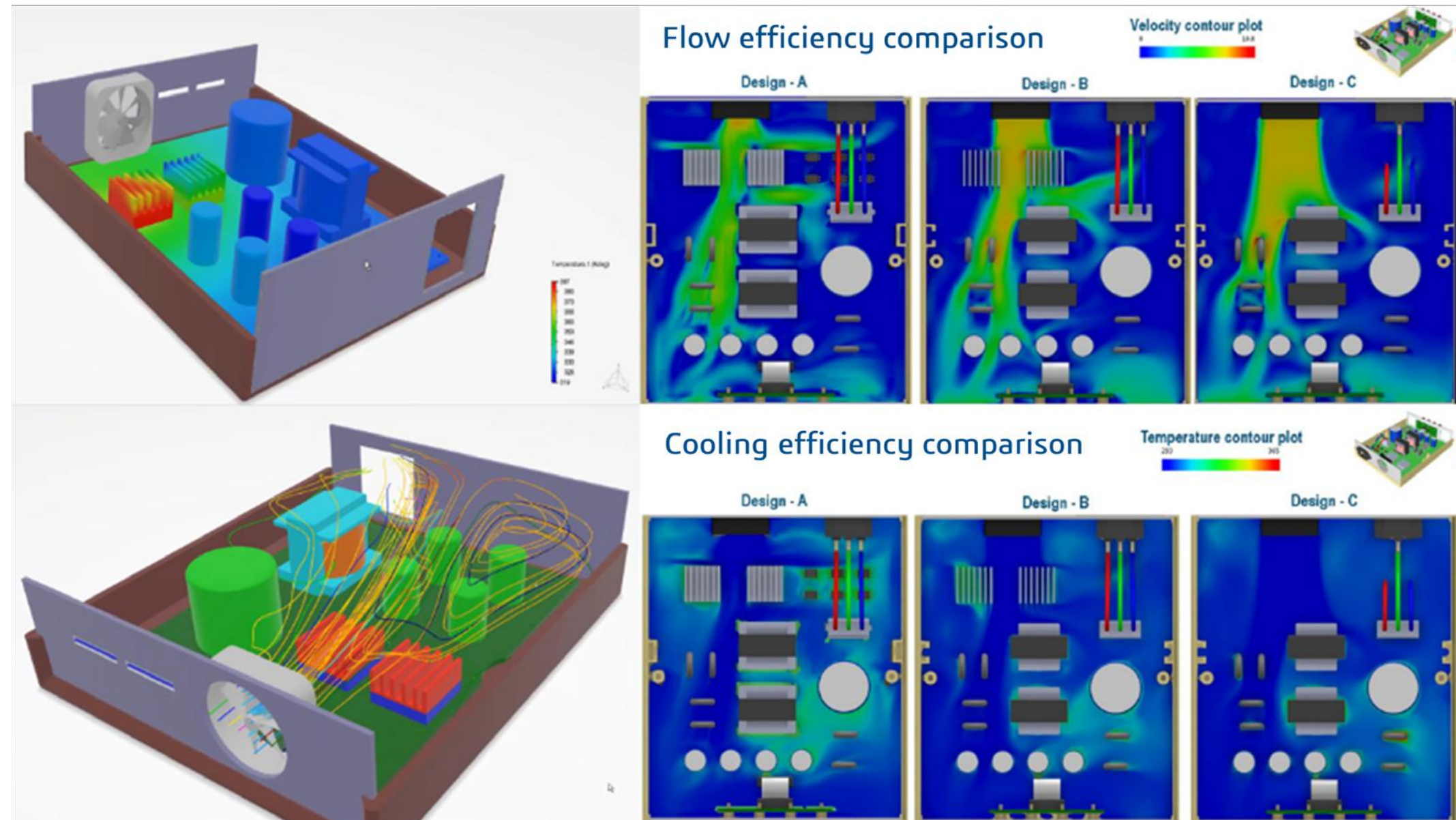
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## GET AHEAD OF THE COMPETITION WITH FASTER TIME-TO-MARKET

- Benefit from a shorter learning curve and faster model setup with the guided user interface
- Dramatically reduce model build time with automatic fluid extraction and meshing leveraging in-house hex-dominant mesh (HDM) technology
- Perform design of experiments (DOE) and optimization studies to assess performance trade-offs and identify optimal designs
- Build, deploy and re-use fully automatable design exploration processes



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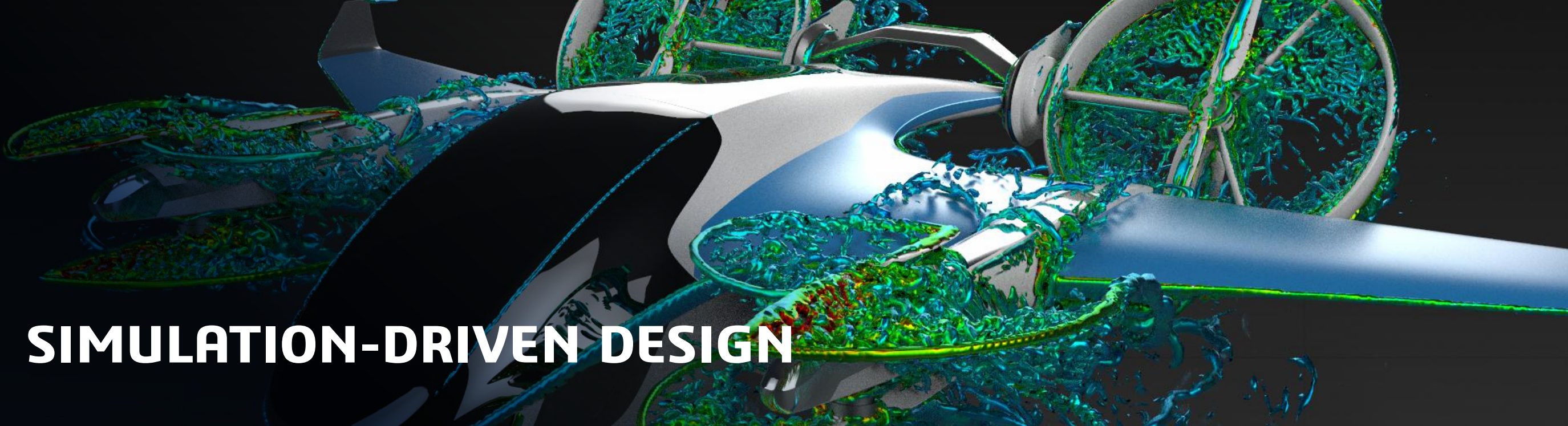
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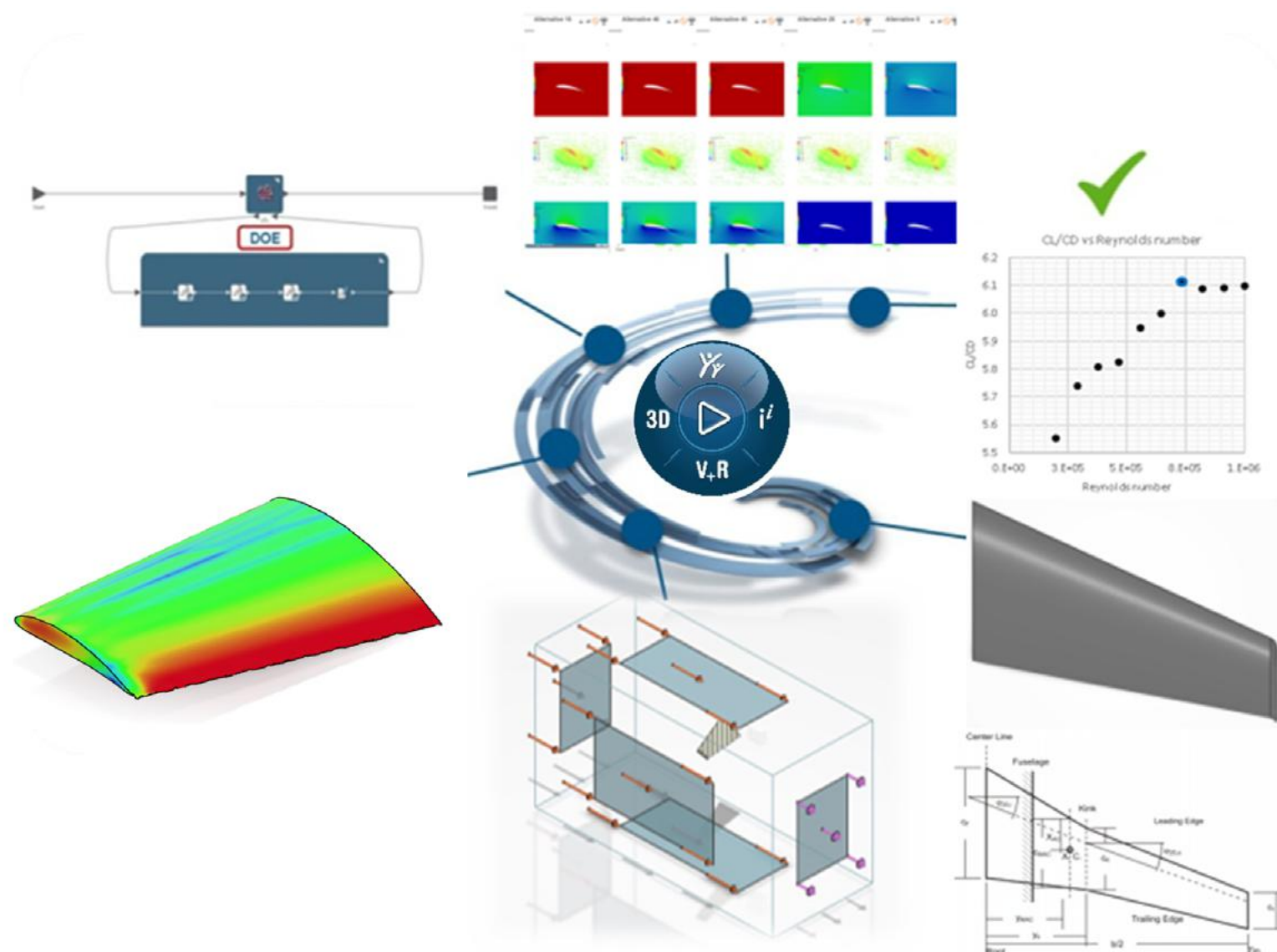


# SIMULATION-DRIVEN DESIGN

**3DEXPERIENCE** automation for design exploration relies on Model-Based Systems Engineering (MBSE), a “system of systems” offering a more complete representation of physical systems.

MBSE connects the dots between different aspects of product design, simulation, engineering and manufacturing using a single modeling language (SysML).

Simulation data is fully integrated with design data to enable design exploration and optimization based on accurate CFD data.



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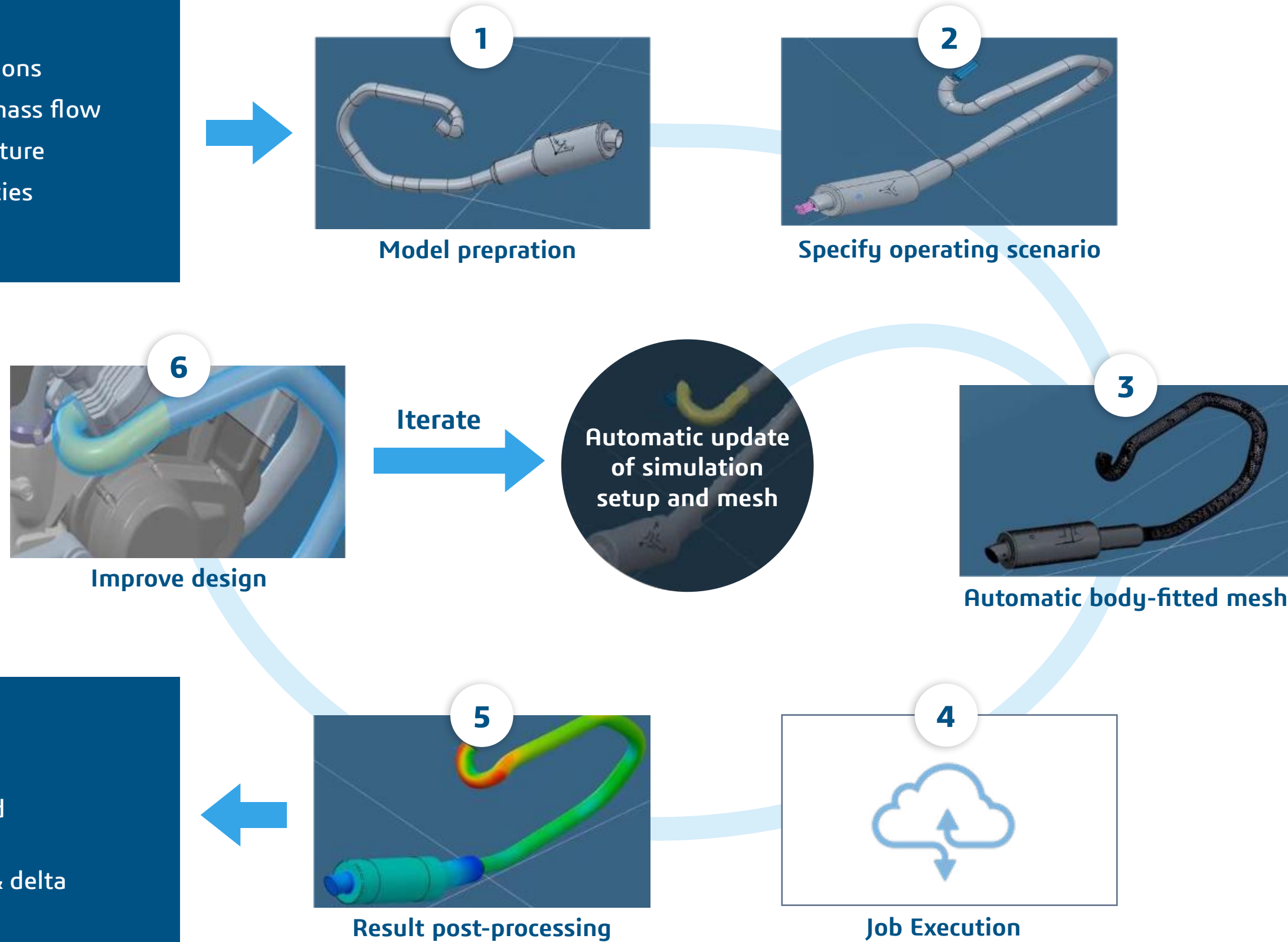
## HOW IT WORKS:

# SIMULATION-DRIVEN DESIGN WITH FLUID DYNAMICS ENGINEER ON THE 3DEXPERIENCE PLATFORM

Designing a motorcycle exhaust - automatic simulation model update with design changes

### Inputs

- Operating conditions
- Engine exhaust mass flow rate and temperature
- Catalyzer properties
- Native Geometry



### Outputs

- Optimal design
- Flow velocity and temperature
- Pressure profile & delta

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# BROAD PHYSICS COVERAGE

Our industrial applications team and core R&D group have years of experience working with customers across industries on strategic projects involving product roadmap planning as well as extensive validations for accuracy, efficiency and robustness.

Hence, Fluid Dynamics Engineer Role offers ready-to-use, relevant solutions with powerful technology under the hood – while providing a simple, guided user experience for designers, engineers and CFD experts alike.

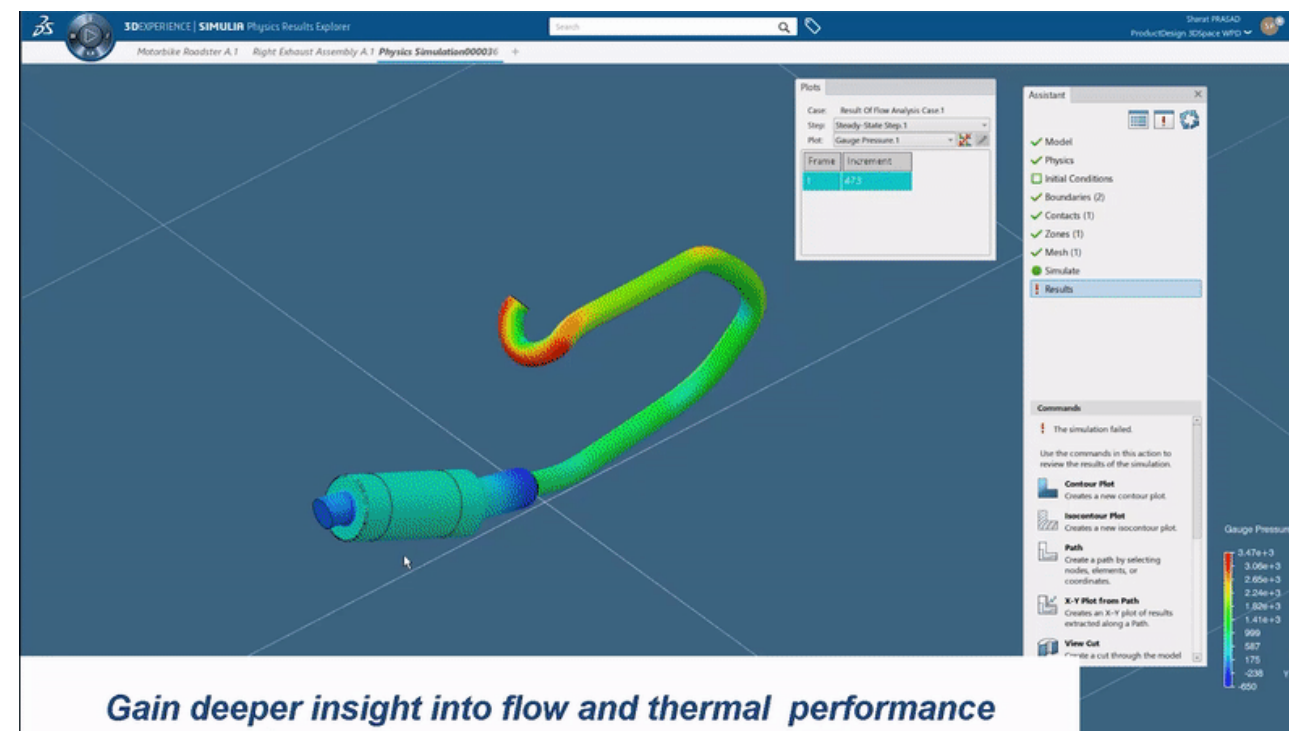
The heart of the solution is 3DSFlow solver, bringing together the industry-standard finite volume mesh-based Reynolds Averaged Navier Stokes (RANS) method enabling users to solve steady state and unsteady/transient (URANS) fluid flow and thermal simulations.

**3DSFlow** solver delivers broad physics coverage to address mainstream CFD applications, including:

- Laminar and turbulent flows
- Incompressible and compressible (subsonic, transonic, supersonic) flows
- Newtonian & non-Newtonian flows
- Multiphase flows
- Multispecies
- Particle tracking
- Rigid body motion (mild deformations)
- Modeling techniques (fans, MRF, baffles, porous media, electronic components)

**Covers mainstream CFD applications for:**

- Aerospace
  - Automotive
  - Exploration & Production
  - HVAC systems
  - High Tech
- ...and more



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# CLOUD COMPUTING POWER

Cloud computing resources enable organizations to leverage instantly available resources to perform simulations of any size or complexity, whenever they need them.

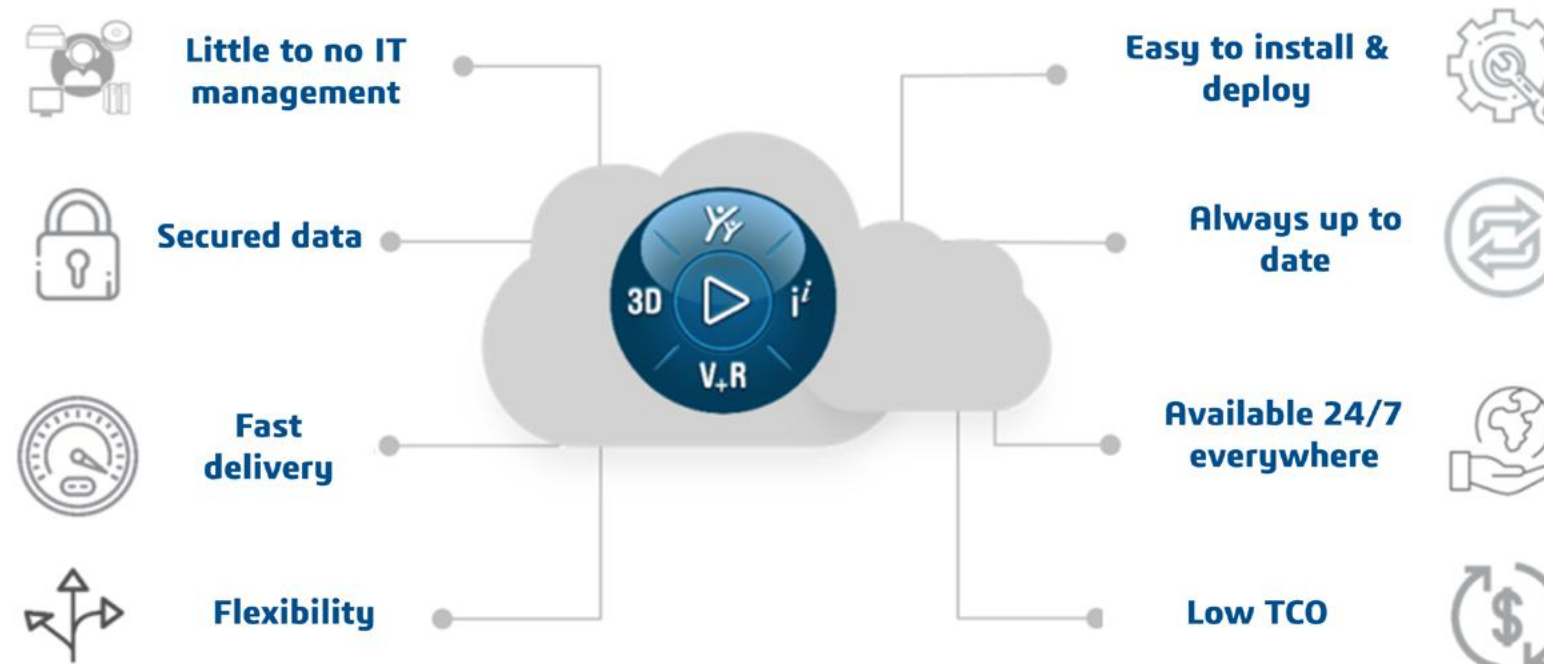
Install and get started within an hour, and expand beyond local hardware and software capabilities. Solve large, complex problems faster than in a desktop-only environment, and purchase additional cloud credits anytime to increase computing resources as needed.

The 3DEXPERIENCE platform connects CFD simulations to CAD and PLM data. Any design changes are easily updated in the simulation, and results are fed back into the 3D design right away.

Cloud-based simulation is fast, powerful, and cost-effective with Fluid Dynamics Engineer and the 3DEXPERIENCE.

## Perform fast, powerful, cost-effective simulations on the cloud

- Reduce IT costs for hardware and software with the benefits of cloud architecture
- Solve larger and more complex models with cloud computing resources
- Accelerate turn-around time through HPC thanks to larger computing clusters and enhanced scalability
- Get started within an hour with ultra-fast cloud deployment



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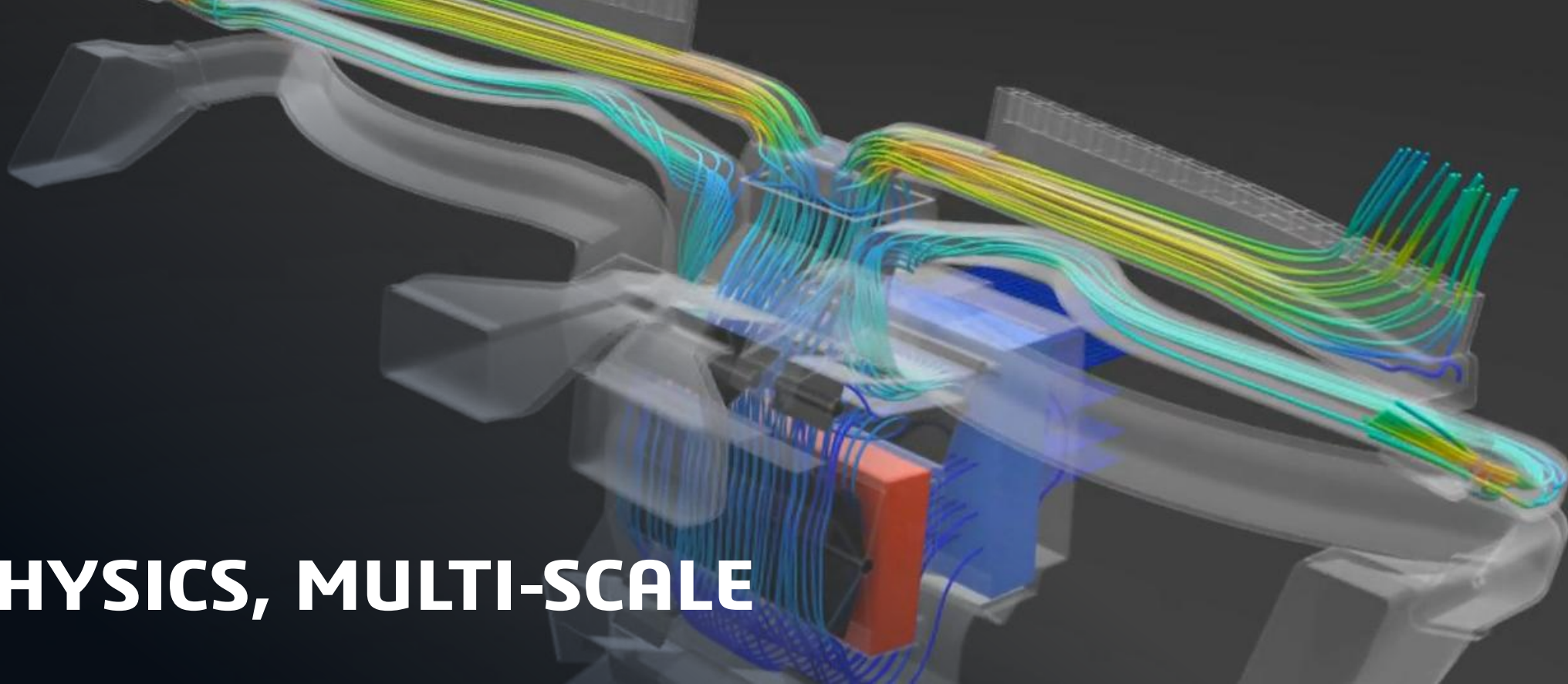
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# MULTI-PHYSICS, MULTI-SCALE



Today's design and engineering requirements are so complex that many simulation tools slow down workflow. Multiple simulations need to be performed using niche solutions, then fed back into design data for further simulations.

The **3DEXPERIENCE** platform offers a unified ecosystem to drive your design process with accurate, multi-physics, multi-scale simulation capabilities. Perform simulations with one-way or two-way couplings between multiple physics, or couple a 3D simulation to a 1D system model to capture multidisciplinary requirements. It's a unified ecosystem that brings together CAD, PLM, and all types and scales of simulations.

Connect multi-physics, multi-scale simulation to your 3D model data to run scenarios and optimize designs quickly and accurately.



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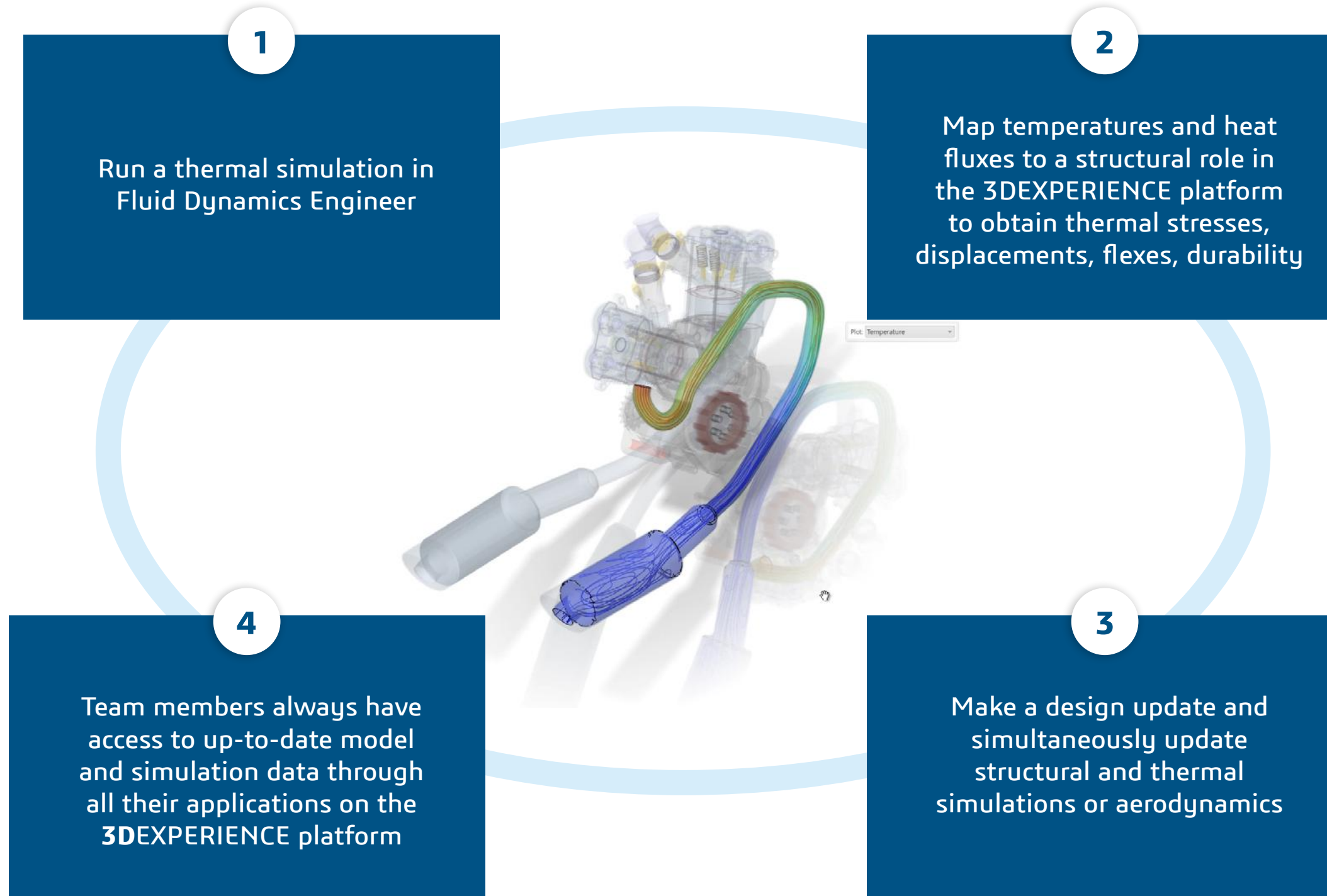
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# THERMAL STRESS ANALYSIS USING FLUID AND STRUCTURAL ROLES ON THE CLOUD



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# FLUID DYNAMICS ENGINEER AND THE 3DEXPERIENCE PLATFORM

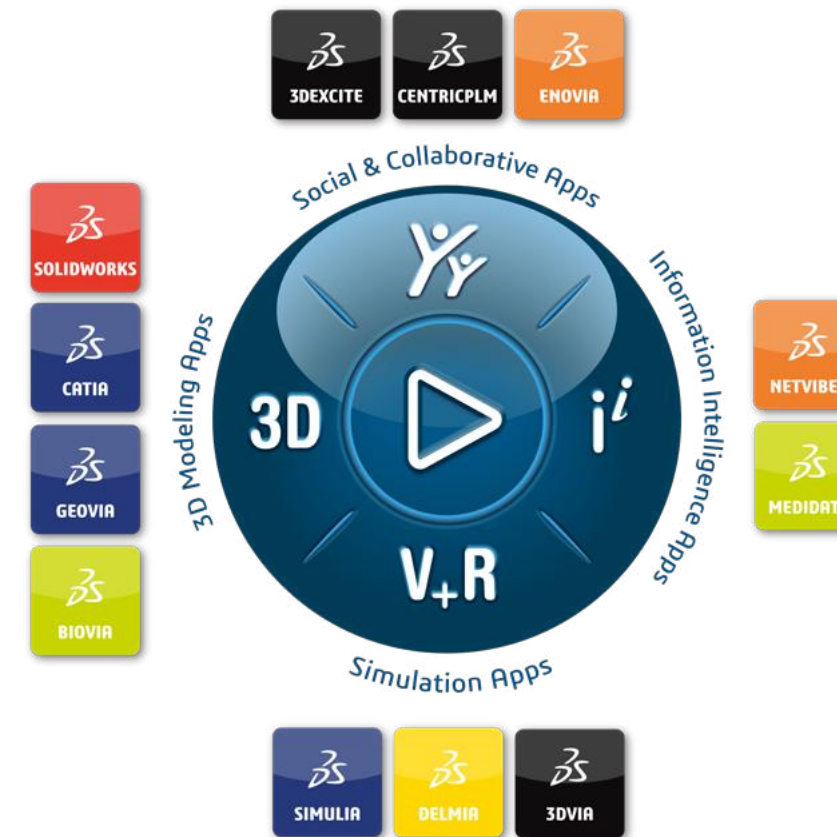
Fluid Dynamics Engineer allows designers, engineers and analysts, with or without prior simulation experience, to perform accurate CFD and CHT simulations to guide design decisions in the early stages.

- Inspire innovation by merging design and simulation
- Accelerate time-to-market with concurrent fluid flow and thermal transfer optimization
- Simplify workflow with a single solution for multiple mainstream CFD applications
- Automate design exploration for designers
- Perform simulations and analysis in a powerful, unified, multi-scale, multi-physical environment on the cloud

Achieve optimal fluid performance with 3DEXPERIENCE® Fluid Dynamics Engineer, make better products and save time with our integrated and collaborative product development platform.

**Speak to one of our experts to get a live demo or learn more.**

[Get started](#)



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