

Choosing the right simulation tool

# SIMULATION BUYER'S GUIDE



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## INTRODUCTION

Simulation and virtual testing enable you to evaluate your product and its performance early in the product development process.

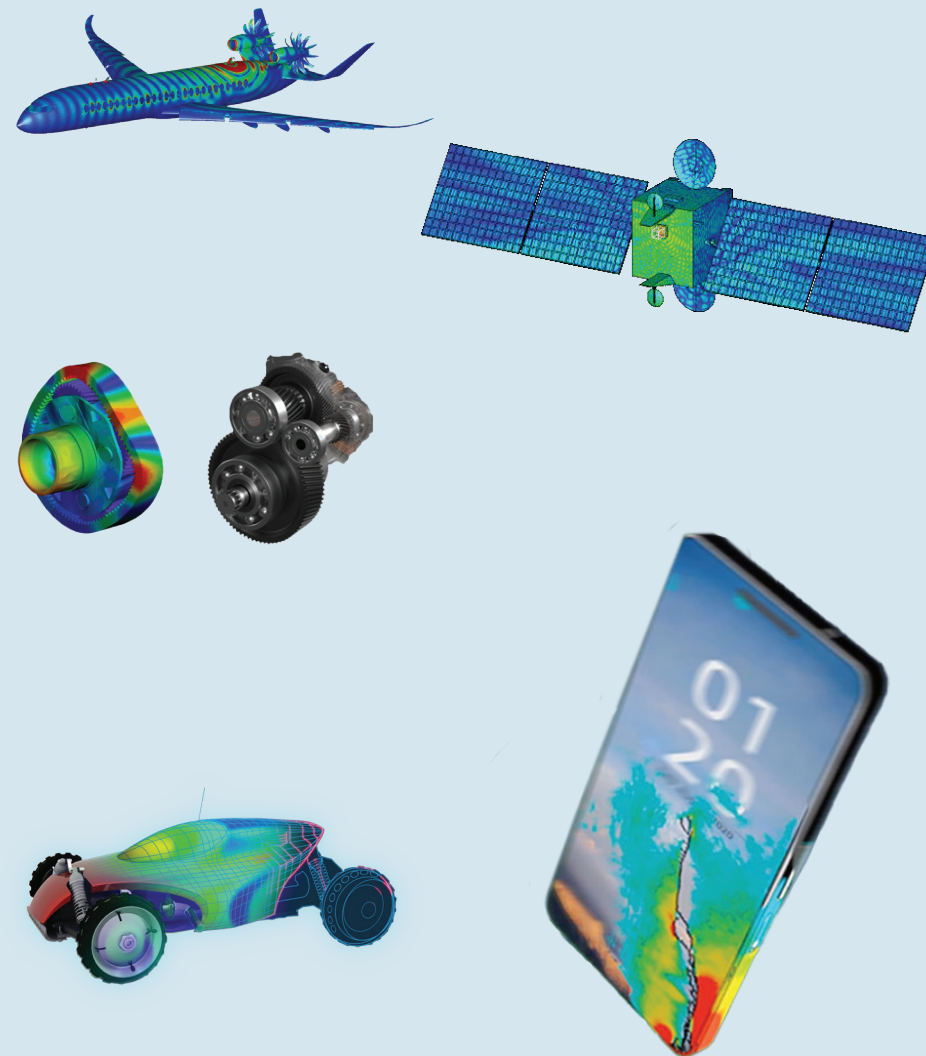
This can be extremely valuable to find problems with the design and designing according to specifications or requirements.

Simulation enables design iterations based on the simulation results allowing you to optimize your design more efficiently.

If used properly, simulation can help you reduce the time and resources spent in testing your final product and reduce the number of prototypes.

Simulation can also help you understand your product's behaviour better and illuminate things that are not possible to test physically.

Deciding on the right simulation tool is not always an easy task. This guide is meant to help you find the most suitable solution for you and your company's needs.



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## DISCIPLINES

There are multiple disciplines in simulation. We recommend to use many of them for the best results:

- Structures
- Fluids
- Heat & temperatures
- Electromagnetics
- Multibody systems
- Vibrations
- Resonance
- Acoustics
- Optimization and automation
- And more



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## QUESTIONS TO ASK WHEN LOOKING FOR A SOFTWARE FOR SIMULATION



What type of simulation do I need to perform?

What do I need to evaluate about my design?

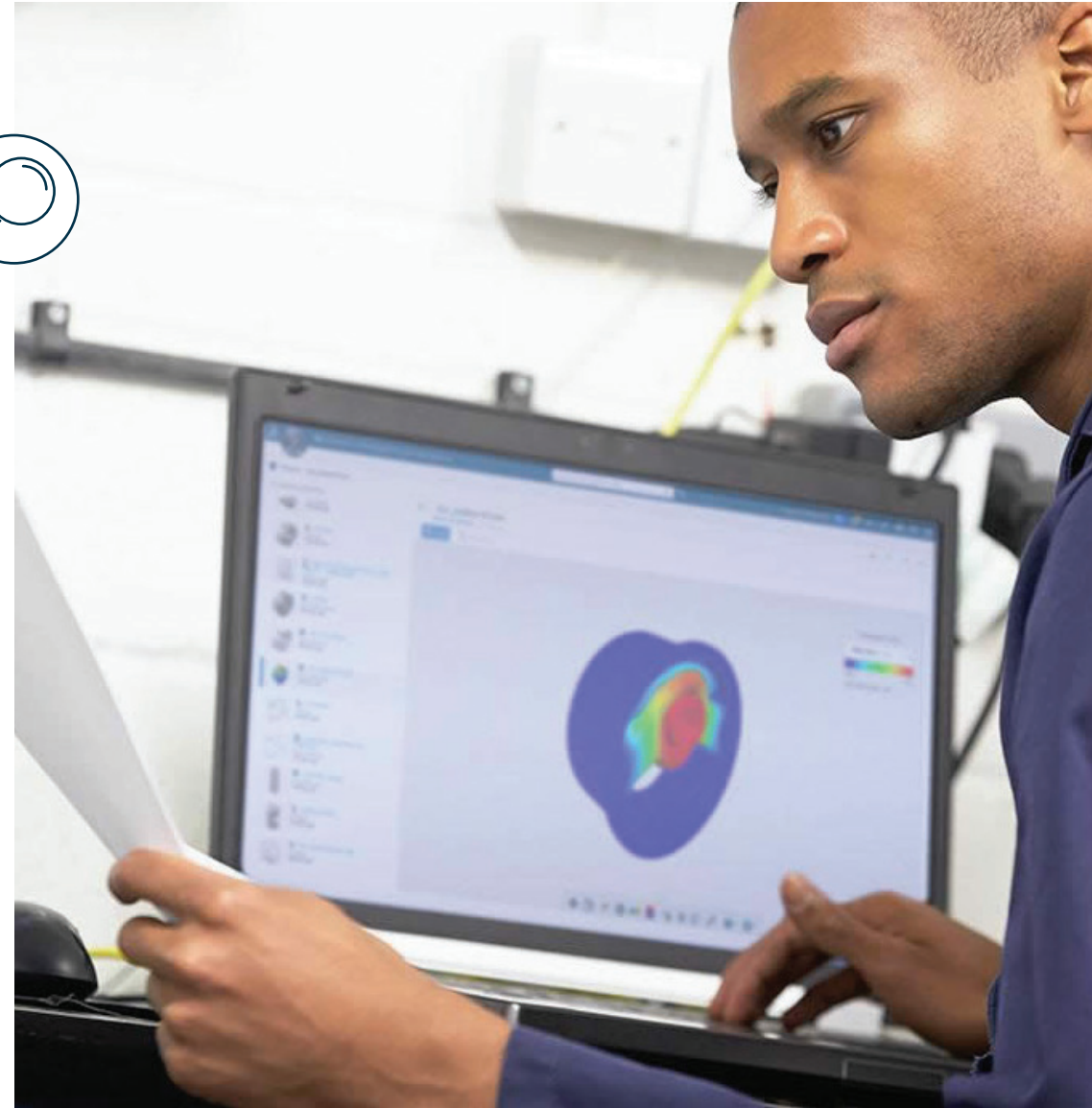
Will I collaborate with my colleagues about the simulations?

Would it be useful to do my simulations on a cloud platform that is common for my company?

What competences do I have in-house for doing simulations?

How can the simulation software integrate or connect to my current CAD system?

What is my budget?



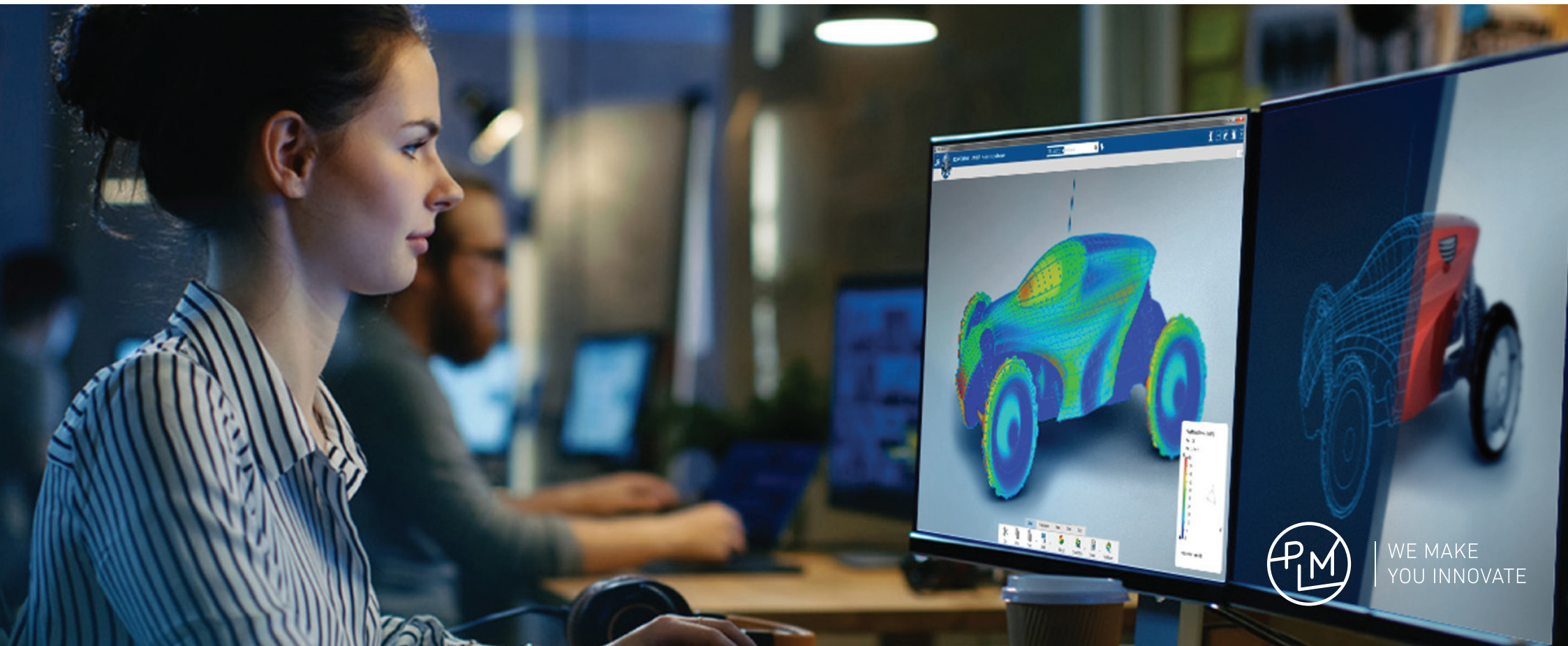
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## WHAT SIMULATION TOOLS ARE THERE?

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The simulation tools PLM Group represents come from Dassault Systèmes, and each have their own characteristics and advantages. This guide will highlight the differences between the different solutions:

- 1) SIMULIA on the 3DEXPERIENCE Cloud Platform
- 2) SIMULIA standalone software
- 3) Solidworks Simulation



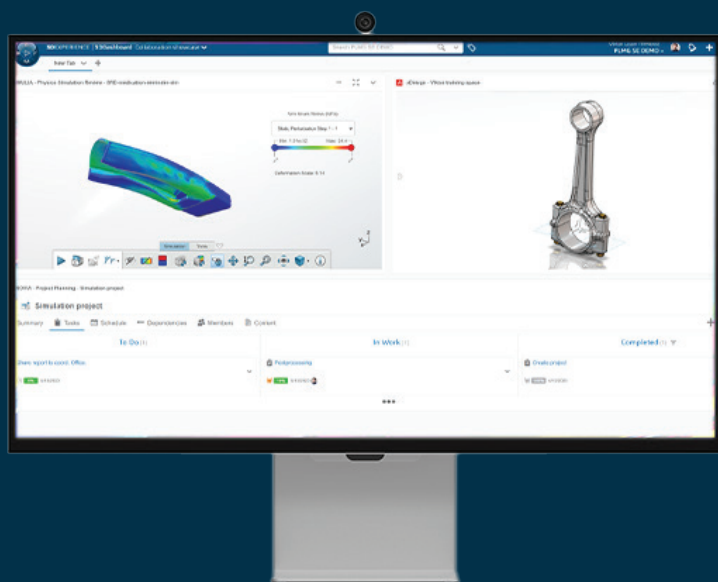
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## SIMULIA ON 3DEXPERIENCE

SIMULIA on the 3DEXPERIENCE Platform uses the CAD-data that you saved on your cloud space and offers a direct link between your 3D-data, simulation setup, results, and project planning.

Collaboration and sharing of simulation results is easy and accessible on 3DEXPERIENCE. CAD-data from SOLIDWORKS, CATIA, and other CAD-systems can be directly used for simulation without the need for exports or format conversions.

SIMULIA on the 3DEXPERIENCE platform come in different roles that give you the tools to simulate different physics.



**Accurate and reliable results.** Simulations are powered by Abaqus, and other powerful simulation tools by Dassault Systèmes.

**Quick and hassle-free results.** Cloud computing with multiple cores is included for free use in most packages and can be expanded. This is ideal to avoid investing in and maintaining your own hardware and allows for offloaded solving.

**Smoother workflow and project handling.** Simulations, 3D-data, collaboration, project planning and more, all connected, and available on a single platform.

**Large assemblies.** Effective reuse of part meshes, meshing rules, and simulation data across different models and simulations make it convenient to analyse assemblies and gather knowledge.

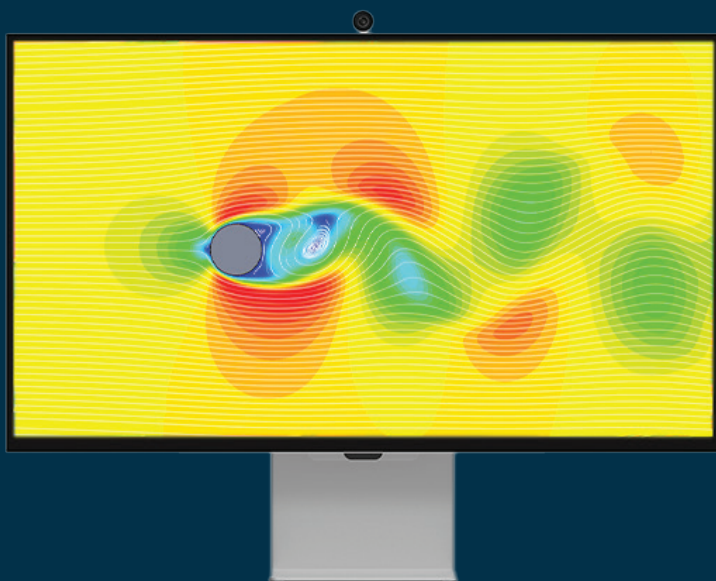
**Model data.** Use CATIA on 3DEXPERIENCE, SOLIDWORKS, or connect other CAD software to simulate directly on the model.



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## SIMULIA 3DEXPERIENCE: FLUIDS

The fluids role on the 3DEXPERIENCE Platform uses a Navier-Stokes solver and as a general-purpose CFD tool is suitable for thermal and cooling problems, some aerodynamic problems, internal flow in pipe systems and more.



### Ideal for companies who need

- a competent solution for fluid analysis with a modern and easy-to-use interface
- sharing of simulation data, setup and results on a common platform, and integrate simulations with the CAD data and product development projects

### Examples of type of analysis and physics

- Internal and external flow, steady state and transient flow, laminar and turbulent flow, Newtonian and non-Newtonian fluids, compressible and incompressible flows
- Conjugate heat transfer
- Selection of turbulence models: SST  $k-\omega$ , Realizable  $k-\epsilon$ , Spalart-Allmaras

### Typical applications

- For example, flow in pipe systems, cooling problems of electronic components

### Consider other options in this guide if

- You are not open to a cloud-based solution
- You need to analyse for example moving geometry, very short transient processes, phase transitions

### Price estimates for yearly rental or subscription

- Starting from 15000€

Please contact us for your plan and price.

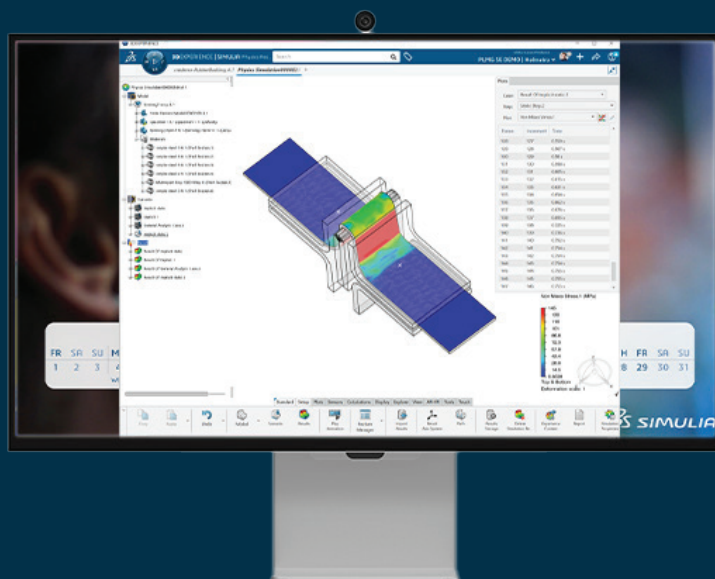


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## SIMULIA 3DEXPERIENCE: STRUCTURES

The structural simulation roles on 3DEXPERIENCE Platform handle static and dynamic, linear and non-linear simulation extremely well thanks to the underlying Abaqus solver technology.

There are several roles available for structural analysis, where the fundamental roles cover linear analysis, and the more advanced roles expand to nonlinear, dynamic, and explicit analysis.



### Ideal for companies who need

- a competent solution for structural analysis with a modern and easy-to-use interface
- sharing of simulation data, setup and results on a common platform, and integrate simulations with the CAD data and product development projects

### Type of analysis and physics

- Linear and nonlinear solvers, implicit and explicit dynamics, transient thermal, linear dynamics, frequency analysis and more
- Durability and fatigue analysis, parametric optimization
- More capabilities are being continuously introduced with each release

### Typical applications

- For example: industrial equipment applications, rubber components, metal plasticity, impact analysis, drop tests, metal forming, complex contact situations, vibration analysis

### Consider other options in this guide if

- You are not open to a cloud-based solution
- You need certain specialized features from for example Abaqus standalone software

### Price estimates for yearly rental or subscription

- Starting from 7400€ or 20000€ depending on physics and role

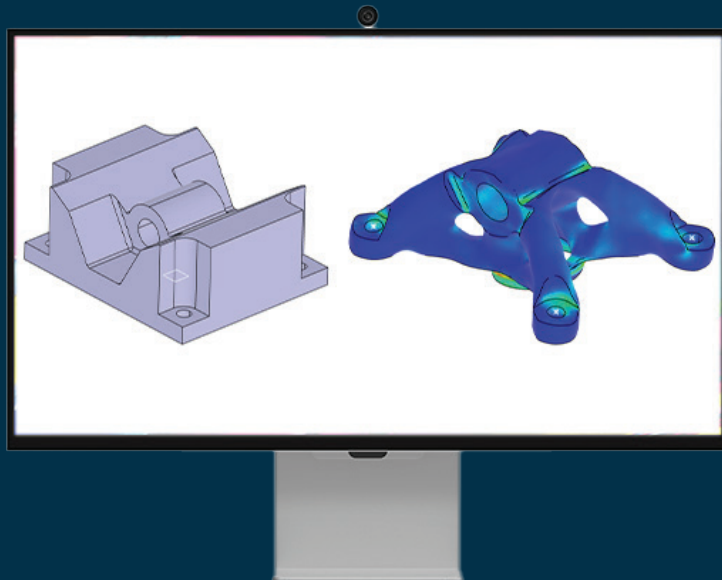
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## SIMULIA 3DEXPERIENCE: MORE

The SIMULIA simulation solutions on the 3DEXPERIENCE Platform span beyond the structural and fluid domains.



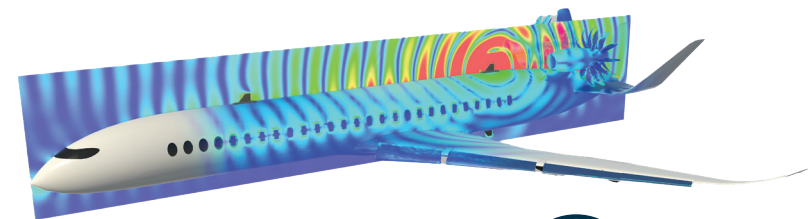
There is a role for simulating **electric and magnetic fields** and their interactions. Electromagnetic simulation can typically address questions like:

- What is the performance of my antenna design?
- How does environment (materials, components, other antennas, etc.) affect my antenna's performance?
- Where should I place my antenna to optimize its performance?

There is also a role for simulation of **the injection molding process** of plastic components through the entire cycle, including filling, packing, cooling and warping or shrinking after ejection. Typical analysis problems are:

- Are the walls and ribs of my plastic component of the right thickness?
- Will any sink marks appear?
- Will the component shrink or warp after cooling and ejection?

Further, there is a set of **optimization tools** for parametric optimization, topology optimization and setup of workflow automation.



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# SIMULIA ABAQUS

- Abaqus is a simulation solution with long history and a general-purpose Finite Element Method solver. With its implicit and explicit solvers, it is widely known and used for structural analysis, however it offers much more
- Simulate conductive and convective heat transfer, mass diffusion, acoustics, piezoelectricity, and electrochemistry either independently, sequentially coupled, or fully coupled with stress analysis
- Abaqus handles highly non-linear problems very well, for example contact analysis. There is also the Discrete Element Method (DEM) for particle simulations, Coupled Eulerian-Lagrangian simulation (CEL), and Smooth Particle Hydrodynamics (SPH)
- A big strength of Abaqus is the modularity – build your own user routines and use Python to create custom scripts and user-routines
- Abaqus be extended with Tosca for topology optimization, Fe-safe for durability and fatigue analysis, and Isight for optimization

## Ideal for companies who need

- High-end simulation with high demands on customizability and control

## Type of analysis and physics

- Structural analysis, stress analysis, but also conductive and convective heat transfer, mass diffusion, acoustics, piezoelectricity, and electrochemistry either independently, sequentially coupled, or fully coupled with the stress analysis
- Highly non-linear problems with contact and nonlinear materials

## Consider other options in this guide if

- you prefer a very guided user interface and built-in assistance tools or a cloud-based solution
- you need a high-level of integration to your CAD system or collaborative tools to share your data in your team, consider SIMULIA on the 3DEXPERIENCE platform

## Price estimate for yearly rental or subscription

- Starting from 20 000€, although this depends highly on your needs

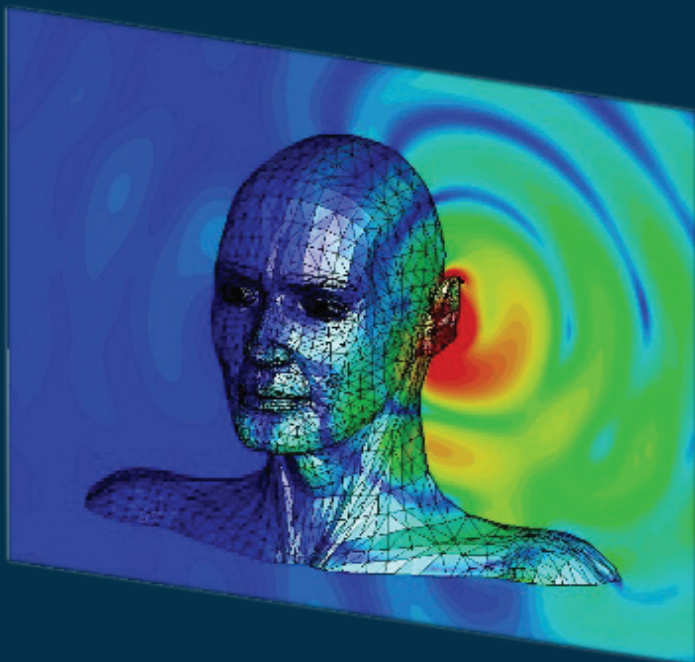
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## SIMULIA CST STUDIO SUITE & SIMULIA SIMPACK

SIMULIA by Dassault Systèmes spans beyond many physical domains and there are more solutions for the expert analysts to be aware of: electromagnetics and multibody dynamics simulation. If you wish to perform high level simulations in these disciplines, we recommend SIMULIA CST Studio Suite and SIMULIA Simpack.



### **SIMULIA CST Studio Suite**

With CST you can design and optimize the electromagnetic (EM) performance of electrical devices, components, parts and EM applications on EM spectrum below the frequency of light. Analyse the behaviour of your antenna design and study electromagnetic compatibility (EMC) of your device. With CST you can make electric and magnetic fields visible and see how physics are creating the operation of your design. It helps to understand the fundamentals and root causes and further modify our design accordingly in order to meet the required specifications.

### **SIMULIA Simpack**

The universal solution for multibody system simulation. It can be used for the dynamic analysis of any mechanical or mechatronic system in time and frequency domain. 3D models can be generated to analyse motions, velocities, accelerations, coupling forces and stresses.

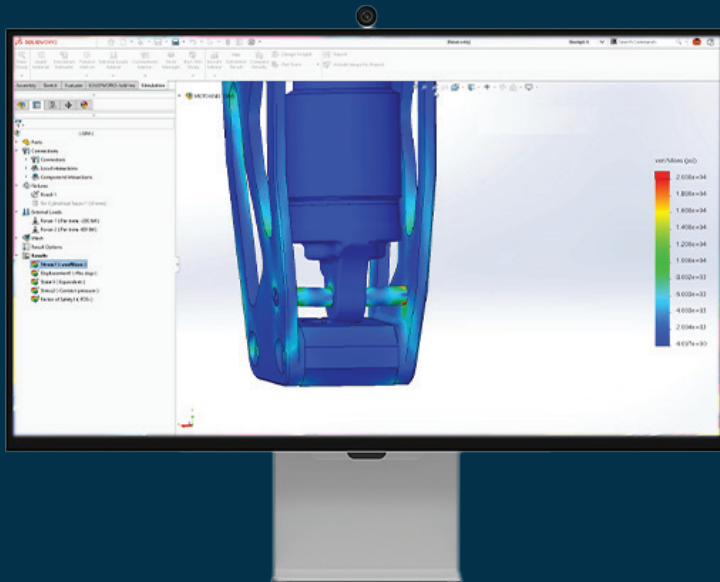


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# SOLIDWORKS SIMULATION SUITE

SOLIDWORKS Simulation offers several simulation solutions to quickly evaluate a design models, make adjustments, rerun simulations and easily evaluate a wide range of design ideas.

It is especially good for those who need to quickly evaluate designs and are already using SOLIDWORKS.



## Ideal for companies who

- need a straightforward simulation tool to evaluate the design of their products
- are SOLIDWORKS Desktop CAD users or plan to start using SOLIDWORKS for modelling and design

## Consider other options in this guide if

- you are using any other CAD software than SOLIDWORKS
- you need multi-step analysis, impact analysis, high speed fluid flow, have complex material models, or need full control over the details of your simulation

## Price estimates for yearly rental or subscription

- Starting from 2400€ or 7800€ for structural analysis
- Starting from 7400€ or 14800€ for fluid analysis

Please contact us for your plan and price.



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## SOLIDWORKS SIMULATION SUITE – TYPES OF ANALYSIS AND PHYSICS

**Simulation Standard** enables structural linear static analysis of parts and assemblies, with solid, shell and beam elements and is a good tool to start for a new simulation user.

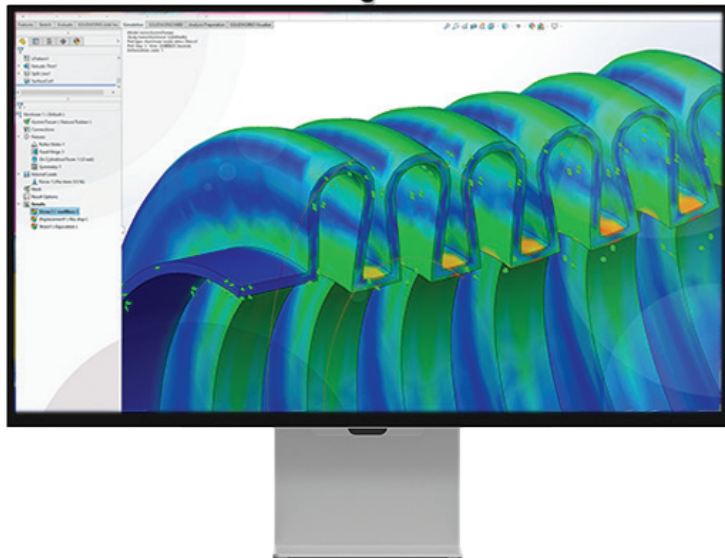
**Simulation Professional** adds more analysis types. For example; frequencies, thermal, topology and buckling.

**Simulation Premium** adds capabilities for some non-linear static and dynamic analysis and linear dynamic analysis of vibrations. For example, for analysing rubber components or simple plasticity situations.

**SOLIDWORKS Flow Simulation** is used for internal and external flow of liquids and gases, such as flow in pipes. It has a variety of features to model for example electronics cooling or air flow distribution problems.

**SOLIDWORKS Plastics** for simulation of the injection molding process for designing plastics components and the molds or tools.

**SOLIDWORKS Motion** is included in Simulation Standard and expands the basic capability from the CAD packages into rigid body dynamics analysis



## COMPARE SOLUTIONS

SOLUTION	TYPICAL USE	PRICE	CONTROL OVER THE ANALYSIS, RANGE OF SETTINGS	EASE OF USE	LICENSING	SYSTEM
SOLIDWORKS Simulation	For SOLIDWORKS CAD Desktop user, design evaluation	Low	Low	Easy	Standalone, term-based or floating network license	Windows
SIMULIA 3DEXPERIENCE	For most users. Many tools and ways to integrate simulation into the product development	Medium-high	Medium	Medium	Named User	Windows
SIMULIA Software	Expert analyst with high demands on customizability and control	Medium-High	High	Professional	License server	Windows/Linux

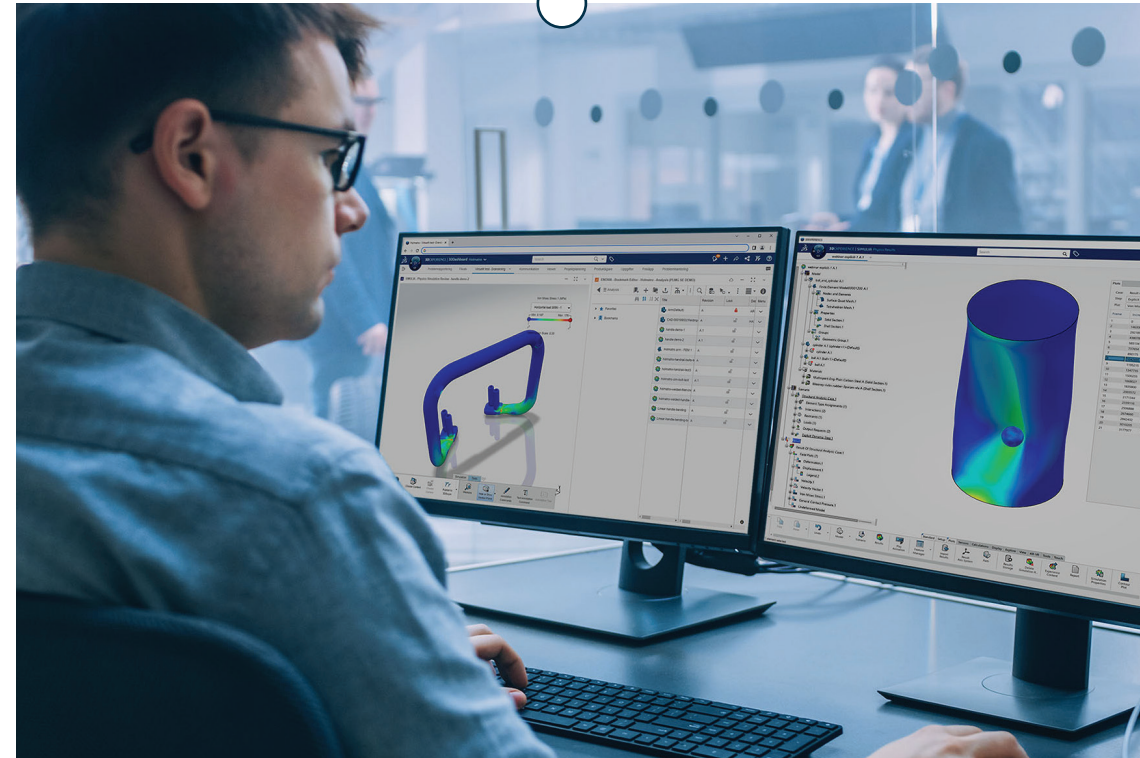


## CONCLUSION

PLM Group offers a wide selection of simulation tools, suitable for smaller and larger companies for all simulation needs.

In addition to the Designer-focused SOLIDWORKS Simulation and the Analyst-focused SIMULIA Abaqus, there are competent simulation solutions available: SIMULIA Simpack and SIMULIA CST Studio Suite as well as simulation tools on the cloud, where you can leverage the PDM and PLM functionalities of the 3DEXPERIENCE more easily and have your simulations in the context of the product development with real-time collaboration capabilities.

The simulation tools work very well together with the CAD solutions by Dassault Systèmes: CATIA and SOLIDWORKS. With this guide you have taken one step further in finding the right solution for your needs. We are more than happy to help and advise you in person and if you did not find a tool for your needs, we invite you to contact us to discuss your options.



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## REACH OUT TO US

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### **EVERY NEED IS UNIQUE – SO IS THE RIGHT SOLUTION FOR YOU**

Choosing the right solution usually starts with looking at the specific simulation need, the features and functions of the available solutions, the competence and skill of your preferred reseller and your budget. It's also a choice, where different departments are involved, a lot of considerations to be aligned. We want to do everything in our power to make your choice of simulation solution right and easy.

### **WHAT DO YOU NEED TO CONSIDER TO MAKE THE RIGHT DECISION?**

The cost of making a wrong decision can be high, at the same time it can be hard to foresee the company's need in the future – and if a solution which seems perfect today, may not be good for the future version of your company. For this reason, it is good to know that our solutions can be extended, upgraded, and customized so that it can grow with you.

### **NO MATTER WHAT YOU CHOOSE, WE HAVE EXPERTS READY FOR YOU**

We support and train our customers in all the solutions that we sell, and we take pride in keeping our experts certified so that you can expect to get answers on any question that you might have. It is in PLM Group's interest that you select a simulation tool you are happy with today and tomorrow – and we want to support you through the journey.



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## WE MAKE YOU INNOVATE

Our mission is to empower people and companies to innovate. We do that by digitally transforming your entire value chain, integrating every stage of the product lifecycle from design to aftermarket.

As an innovation partner we support companies across many industries. We have been collaborating with Dassault Systèmes for over 25 years as a value-adding partner. Our 3D Printing division co-operates with world-leading additive manufacturing companies, allowing us to provide our customers with the latest and greatest technologies.

Are you ready to embark on your journey? Our local teams of experts and global partnerships are at your service.

THANK YOU FOR READING!

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