

SIEMENS

Ingenuity for life

Simcenter on the Rescale cloud platform

Providing cost-effective, scalable and on-demand simulation solutions

Benefits

- Bring products to market sooner by scaling up modeling and simulation usage
- Increase innovation and product quality with more thorough design studies
- Optimize the mix between capital cost and operational expense for HPC and workstation needs
- Achieve faster time-to-value with rapid deployment using minimal effort
- Deliver scalable access to premium system simulation and 3D CAE simulation tools

Summary

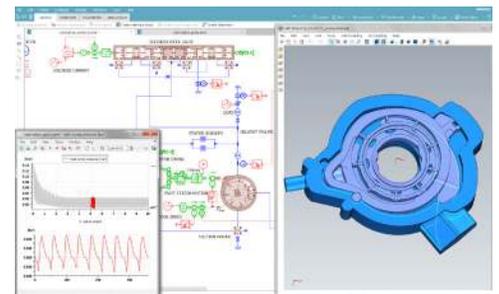
Engineers continuously need to speed up their product development and validation processes, and simulation is an excellent way to glean product performance knowledge earlier in the development cycle. However, the cost of simulation tools and their required computing infrastructure can sometimes be prohibitive, particularly for smaller businesses.

To help you overcome this challenge, Siemens Digital Industries Software has partnered with Rescale, a company that provides a leading cloud engineering simulation platform, to offer Simcenter™ software for system simulation and 3D computer-aided engineering (CAE) simulation, such as structural, motion and flow analysis, in a cloud environment. This enables users around the globe to have on-demand, cost-friendly access to the simulation tools and computing power they need.

The combination of Simcenter and Rescale allows you to leverage the power of cloud-based simulation and cut your time-to-market.

Simcenter on the Rescale platform

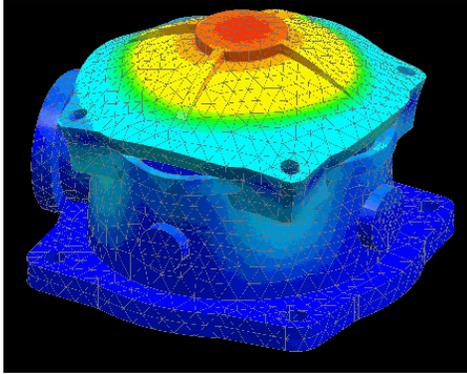
Siemens offers the following simulation solutions through the Rescale platform:



Predict the behavior of mechatronic systems from early design stages using Simcenter Amesim

- **Simcenter Amesim™** software includes ready-to-use multiphysics libraries combined with application- and industry-oriented solutions that are supported by powerful platform capabilities to let you rapidly create models and perform analysis. Simcenter Amesim is an open environment that can be integrated into your enterprise processes. You can easily couple the software with major CAE, computer-aided design (CAD), and controls software packages, interoperate it with the Functional Mock-up Interface (FMI), Modelica®, and connect it with other Simcenter solutions
- **Simcenter 3D** enables you to predict the performance of your 3D geometry-based designs. It combines best-in-class

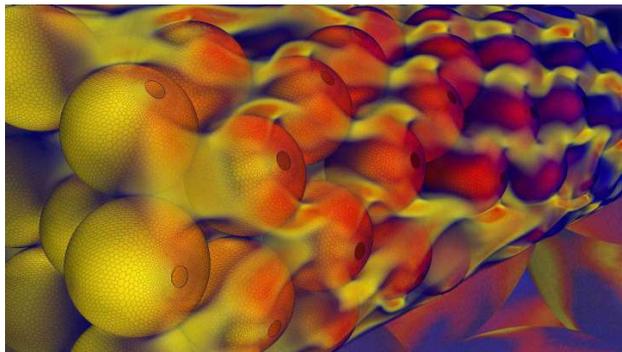
Simcenter on the Rescale cloud platform



Perform the entire structural simulation process – mesh, solve and postprocess – all on the cloud with Simcenter 3D

geometry editing, associative simulation modeling and multi-discipline solutions, which reflects Siemens' vast industry expertise. This means you can import geometry from any CAD source and prepare, solve and evaluate analysis models in a unified environment for a wide range of CAE solutions, such as structural, acoustics, flow, thermal, motion and composites analyses, as well as optimization and multi-physics simulation. The integrated high-end, multi-discipline solutions of Simcenter 3D are scalable for use by general CAE analysts and discipline experts. Additionally, by linking Simcenter 3D to Simcenter system simulation and testing solutions, you can achieve outstanding accuracy

- **Simcenter Nastran®** is a premier finite-element structural solver. Nastran has been an industry-standard FE solver for over 40 years, known and trusted for its reliability in structural analysis for stress, vibration, dynamics and other types of solutions. If you just need access to high-performance computing (HPC) infrastructure for structural solutions, you can use Simcenter Nastran on the cloud to speed simulation of your large structural models
- **Simcenter STAR-CCM+** enables you to accurately predict the real-world performance of your product by



Conjugate heat transfer simulation of a pebble-bed nuclear reactor using Simcenter STAR-CCM+

facilitating the capture all of the physics that will influence its performance during its operational life. To improve your product, you need to be able to predict how performance changes in response to multiple parametric design modifications. Simcenter STAR-CCM+ is a complete multiphysics solution for the simulation of products and designs operating in real-world conditions. Simcenter STAR-CCM+ brings automated design exploration and optimization to the simulation toolkit of every engineer, allowing users to efficiently explore the entire design space instead of focusing on single point design scenarios

Rescale was founded in 2011 and has grown rapidly to become a leading cloud-simulation provider, offering an integrated solution that combines simulation software with customizable hardware infrastructure for companies to perform scientific and engineering simulations. Rescale serves both large enterprises and small-to-medium-sized businesses in a diverse range of industries, including aerospace, automotive, life sciences and energy.

Ease of use

Accessing Simcenter solutions on Rescale is straightforward and intuitive. You have to simply log in to the Rescale platform using a standard web browser, select the desired hardware configuration, Simcenter software and licensing options. Once your desktop is set up, you can use Simcenter software just as you would on your own desktop. Full online documentation is available, including tutorials to help you get up to speed quickly if you are a new Simcenter user.

Flexible licensing options

Simcenter Amesim, Simcenter 3D, Simcenter Nastran and Simcenter STAR-CCM+ are available on the Rescale platform as platform-as-a-service (PaaS) and bring-your-own-license (BYOL). You can purchase a license from Siemens

Digital Industries Software as you would for a traditional software license, and then use that license in conjunction with the Simcenter tools that are deployed on the Rescale platform. This lets you leverage your existing investments in Simcenter solutions.

Simcenter Amesim, Simcenter 3D and Simcenter Nastran are also available on the Rescale platform as software-as-a-service (SaaS). You can purchase Simcenter usage via a subscription. The license is provided by Rescale along with a choice of hardware configurations to run the simulations. The SaaS option may be preferred if you wish to minimize upfront costs associated with purchasing software and hardware.

The described licensing options above refer to software usage. In addition, Rescale charges for hardware usage on a price per-core, per-hour basis.

On-demand high-performance computing

Performance is what makes Simcenter the solution of choice for users who need to solve today's increasingly large and complex problems. Siemens has heavily invested in solver performance. For example, Simcenter Nastran can be used to solve large-scale dynamics problems that can be divided into several pieces and sent to multiple processors. With just four central processing units (CPUs), the solution required almost 400 minutes, just over 6.5 hours. But spreading the solution out over 512 CPUs reduced the solution time to just 38.5 minutes – more than 10 times faster.

Simcenter solvers on the Rescale platform give you on-demand hardware scalability to fulfill short-term needs, such as an investigation into an urgent warranty issue. The Rescale cloud infrastructure has already been configured and optimized to take full advantage of each solver's performance, which means you don't need to invest

in an information technology (IT) infrastructure to support the use of Simcenter solvers on a high-performance computing (HPC) cluster.

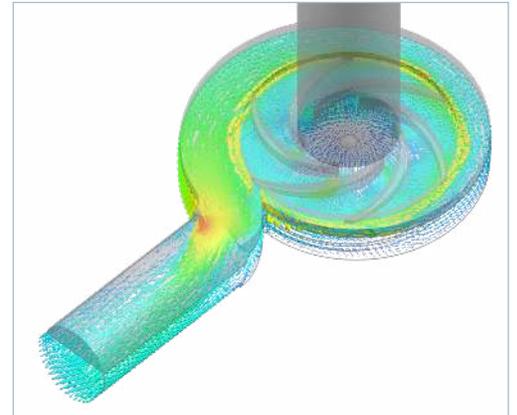
To support these different needs, Rescale has tiered levels of hardware, including high-end machines with large memory and disk space. At the high end of the spectrum, customers can access over 10,000 cores that enable even the largest of models to be solved efficiently. The Rescale file transfer system can also be used to efficiently upload or download files larger than 100 gigabytes (GB), and has been tested on files as large as 2 terabytes (TB).

Platform security

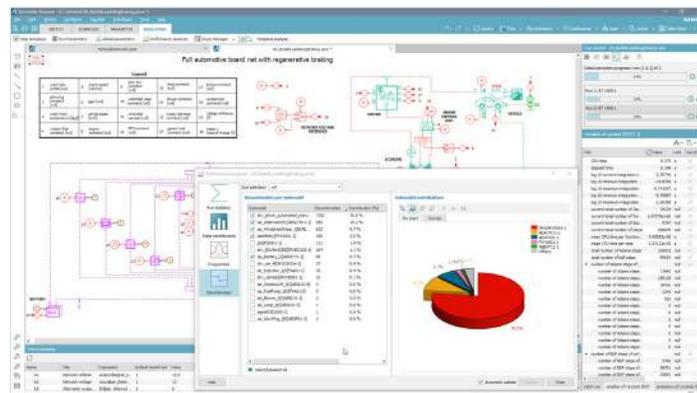
Maintaining data security is an important consideration for every company that is contemplating investing in a cloud-based solution. Rescale has built proprietary, best-in-class security features into its platform. Customer data is encrypted end-to-end and jobs are run on private, closed clusters. IT administrators can manage access and security controls at every level of the organization. In addition, Rescale is compliant end-to-end with the International Traffic in Arms Regulations (ITAR) and Service Organization Controls (SOC 2) compliance requirements.

Design of experiments

Design of experiments (DOE) simulations are a useful methodology for



Simulate fluid flow with Simcenter 3D



Create and run your Simcenter Amesim models efficiently and everywhere

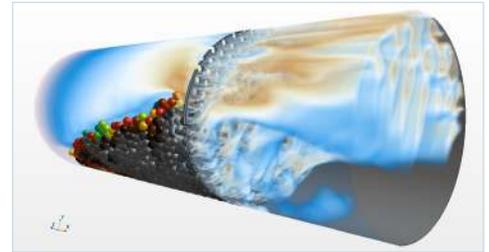
understanding product performance when there is variability so you can design products to more robustly adapt to parameter variations. Traditional licensing models often make it challenging to run DOE simulations due to the large number of licenses that are needed to execute parallel runs. On Rescale, the Simcenter solver is used as part of a DOE solution and is solved using parallel pricing, but volume is discounted so the cost per-run, per-hour decreases as more runs are executed.

The Rescale DOE option automates the process of running a model with many property variations so engineering teams can develop more robust designs. The Rescale platform automates the submittal process of varying the input files and launching the multiple runs. Once the DOE runs are complete, the user can preview and plot the results in the browser window prior to downloading the output data for further postprocessing.

Getting started

Siemens Digital Industries Software and Rescale have partnered to help you get started using Simcenter on the cloud with a no-risk free trial. Simply go to the Siemens page on the Rescale website (<https://www.rescale.com/siemens/>) to create an account and learn more about Simcenter solutions on the Rescale platform. With Rescale, you get:

- 100GB free storage and data transfer per month
- Up to 240GB of random access memory (RAM) per node and solid state drive (SSD) storage
- Secure, encrypted data transfer and storage
- No queue – instant HPC clusters on-demand



Run multi-physics simulation involving solid particle transfer using Simcenter STAR-CCM+

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