



SIEMENS

Ingenuity for life

Simcenter solvers on the Rescale cloud simulation platform

Providing cost-effective, scalable, on-demand 3D simulation solutions

Benefits

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

Summary

Engineers increasingly need to speed up their product validation process for solving large models or for performing sensitivity analyses over a large number of parameters. To do this with their current infrastructure can be prohibitively time-consuming or computationally intensive.

To overcome this challenge, Siemens PLM Software has partnered with Rescale, a leading a cloud engineering simulation platform, to offer Simcenter solvers for structural, thermal, flow analysis and multi-discipline simulation in a cloud environment so users around the globe now have easier access to the simulation tools they need.

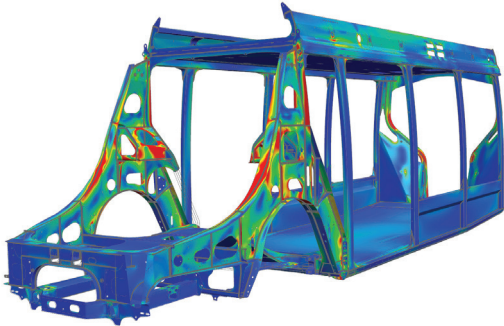
Simcenter solvers on the Rescale platform

Siemens offers the following solvers through the Rescale platform:

- **NX Nastran:** Nastran has been an industry-standard FE solver for over 40 years, known and trusted for its strength in structural analysis for stress, vibration, dynamics and other types of solutions.
- **Simcenter 3D Thermal:** A comprehensive thermal solver for heat transfer solutions including conduction, convection and radiation phenomena for complex products and large assemblies. Simcenter 3D Thermal can also be used with Simcenter 3D Flow for coupled thermo-fluid simulation.
- **Simcenter 3D Flow:** A computational fluid dynamics (CFD) solver that enables fast and accurate fluid flow simulation for steady-state, transient, turbulent and laminar flow, convection, and internal or external flows
- **STAR-CCM+®:** A unique simulation solution for fluid dynamics, solid mechanics, fluid structure interaction, heat transfer, particle dynamics, reacting flow, electrochemistry, electromagnetics, acoustics and rheology. It delivers accurate solutions through automated workflows, facilitating the analysis of complex real-world problems.

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

Simcenter solvers on the Rescale cloud simulation platform



Use NX Nastran to perform structural analysis on the Rescale platform.

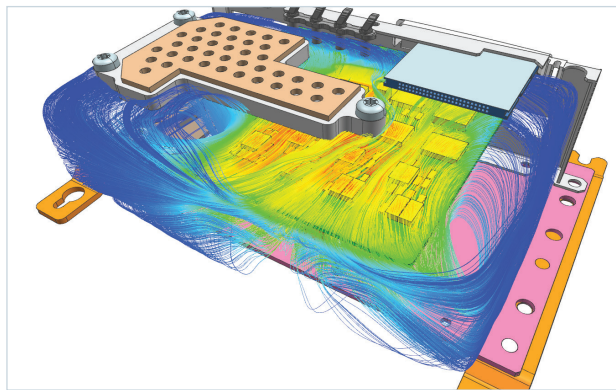
businesses in a diverse range of industries, including aerospace, automotive, life sciences and energy.

Ease of use

Accessing Simcenter's 3D solvers on Rescale is very straightforward and intuitive. The user has to simply login to the Rescale platform using a standard web browser, select the desired hardware configuration, upload the input deck and specify the solver. Input decks may be prepared using Simcenter 3D software, Femap™ software or any other preprocessor that can be used to write NX Nastran or STAR-CCM+ input files. Rescale performs a check on the input parameters and then provisions the cluster for the computation step. During the course of the simulation, users are able to monitor the status of the job in real time and view output files on the platform while the job is running. After the job has been completed, the user downloads the output files to their local machine for postprocessing.

Flexible licensing options

NX Nastran, Simcenter 3D Thermal and Simcenter 3D Flow are all available on the Rescale platform under two different licensing models:



Use Simcenter 3D Coupled Thermal/Flow for multiphysics analyses.

- **Platform-as-a-service (PaaS):** Also known as bring-your-own-license (BYOL), you can purchase a license from Siemens PLM Software as you would for a traditional software license, and then use that license in conjunction with the Simcenter 3D solver that is deployed on the Rescale platform. This lets you leverage your existing investments in Simcenter's solvers.

As part of the bring-your-own-license model, you can use your STAR-CCM+ "Power on Demand" licenses on Rescale. "Power on Demand" lets you access STAR-CCM+ on Rescale by the hour on an unlimited number of cores from any private, public or hybrid cloud. This is ideal for cloud, burst capacity, and infrequent usage and allows you to maximize throughput of large simulations previously not possible due to limited resources.

- **Software-as-a-service (SaaS):** You can purchase solver usage via a subscription or a per-run per-hour usage model. Both the license and the software are 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.

Platform scalability

Performance is what makes Simcenter solvers the solution of choice for users who need to solve today's increasingly large problems. Siemens PLM Software has heavily invested in solver performance. For example, NX Nastran can be used to solve large scale dynamics problems that can be divided into several pieces and sent to multiple processors. With just 4 CPUs, the solution required almost 400 minutes (which is more than 6.5 hours). But

spreading the solution out over 512 CPUs reduced the solution time to just 38.5 minutes – almost 10 times faster.

STAR-CCM+ is massively parallelized, from meshing to solution, and it scales to hundreds of thousands of cores. This helps you to achieve extreme scalability for large simulations and get back results in hours instead of days, allowing you to push the boundaries of your multidisciplinary engineering simulations.

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. Rescale's 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 IT infrastructure to support to use Simcenter solvers on a high performance computing (HPC) cluster.

To support these different needs, Rescale has tiered levels of hardware, including very high-end machines with large memory and large 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. Rescale's 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. Information technology (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 very useful methodology for understanding product performance when there is variability so you can design products to be more robust to parameter variations. Traditional licensing models often make it challenging to run DOE simulations due to the large number of licenses that are needed for parallel runs to be executed. On Rescale, Simcenter solver runs used as part of a DOE solution are solved using parallel pricing, but are volume discounted so that the cost per-run per-hour decreases as more runs are executed.



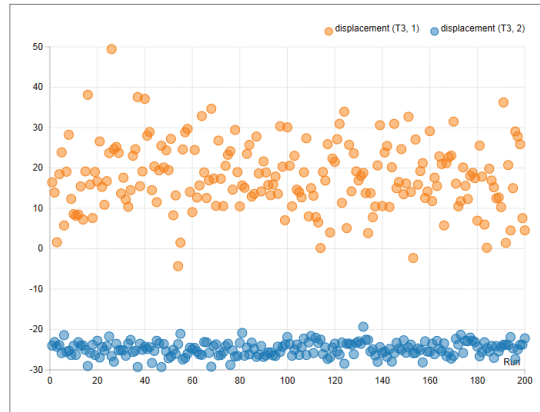
DOE results can be previewed in the browser prior to downloading result files.

The Rescale DOE option automates the process of running a model with many property variations so engineering teams can develop more robust designs. Rescale 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.

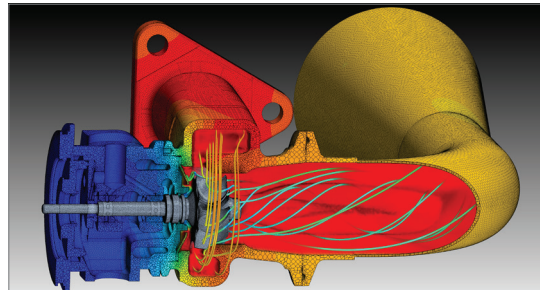
Getting started

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

- No queue – instant HPC clusters on-demand
- 100GB free storage and data transfer per month
- Up to 240GB of RAM per node and SSD storage
- Secure, encrypted data transfer and storage



Monte Carlo DOE results for a satellite dish showing large variation in displacement response at one location indicated by the yellow circles.



Use your STAR-CCM+ Power on Demand license to quickly scale computing resources.

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