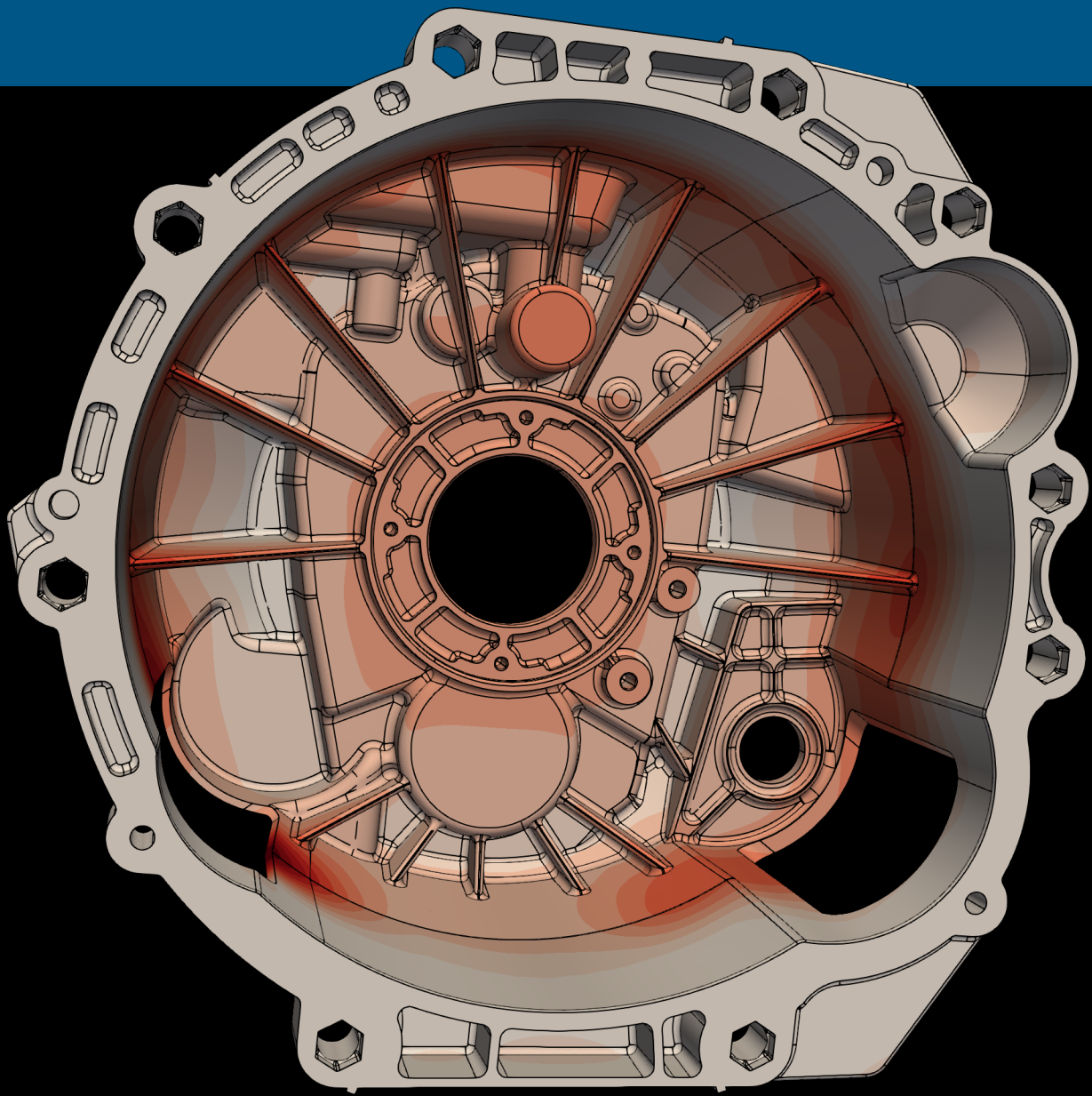


COREFORM CASE STUDY

BRINGING GAME-CHANGING SIMULATION SOFTWARE TO LIFE



Market
CAE, FEA

Product & Services
3D ACIS Modeler, 3D InterOp, Convergent Surface Mesh, Convergent Volume Mesh, Development Services

Setting Out to Reduce Simulation Time

Coreform was poised to make a real impact on the CAE world. By integrating specific Spatial SDKs customized to their needs, Coreform closed the circle on its revolutionary software.

SUMMARY

With the motto “simulation without compromise”, Coreform aims to accelerate engineering design through easier and more powerful FEA. They leverage cutting-edge techniques from FEA and computational geometry to streamline the process of setting up FEA models while providing simulation results that are more accurate and robust than traditional low-order FEA across linear, nonlinear, static, and dynamic simulation regimes. Since their software handles CAD parts, they needed the ability to run simulation data with the most precise geometrical data possible and required geometry import and Boolean preprocessing for their solver. They relied on their long-standing relationship with Spatial to integrate industry-leading components into their software, enabling them to fully address the challenges of simulation software.

THE COMPANY

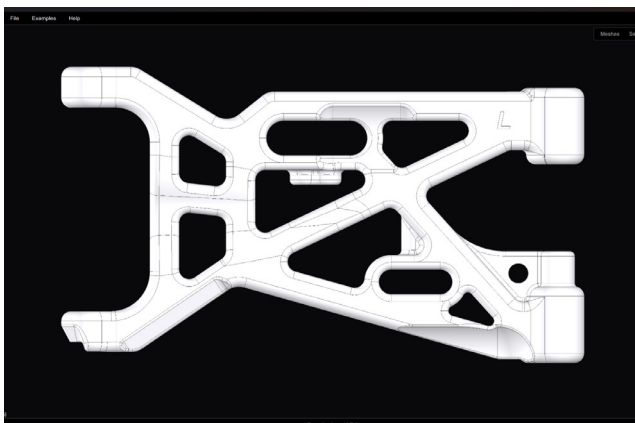
Since 2014, Coreform has provided innovative isogeometric analysis software to the CAE industry.

Coreform delivers reliable results to accelerate design processes, leveraging cutting-edge techniques in Finite Element Analysis (FEA) and computational geometry. With Coreform’s isogeometric analysis (IGA) technology, it will be possible to eliminate the meshing process while offering simulation results that are more accurate and robust than traditional low-order FEA across linear, nonlinear, static, and dynamic simulation regimes.

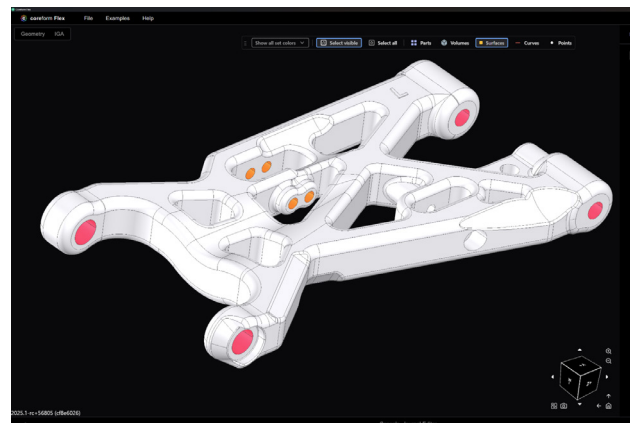
Coreform was founded around solving a common problem in the CAE space: how time is spent and lost in simulation. The vast majority of simulation time is spent on non-value-added activities. While these preparatory activities are necessary for the simulation, they are still peripheral to the primary goal of having the simulation provide you with insight into your engineering design.

The tension between model-building speed and engineering simulation accuracy and robustness is a long-standing, seemingly intractable paradox in commercial FEA. Many products have been developed that optimize one at the expense of the other, often within a limited range of physics. Coreform is addressing this problem by developing advancements to the finite element method that allow users to reduce model-building time with greater accuracy and robustness, across a range of applicability. They are seeking to build simulation technology capable of handling linear-type phenomena all the way up through sophisticated non-linear time-dependent phenomena.

As a result, Coreform software allows its customers to produce accurate simulation results in far less time than with traditional methods. What used to take weeks or even months can now be built in days or a week, depending on the size of the assembly.



Reverse-engineered 3D scan of a front suspension arm from GrabCAD in the Coreform Flex next-generation simulation software.



Geometry sets for simulation: boundaries, loads, outputs, probes, etc.

CHALLENGE

Precise Geometry Import and Boolean Preprocessing

Coreform wanted to dramatically reduce the cost of doing advanced engineering simulation without any additional burden on their customers regarding their CAD system.

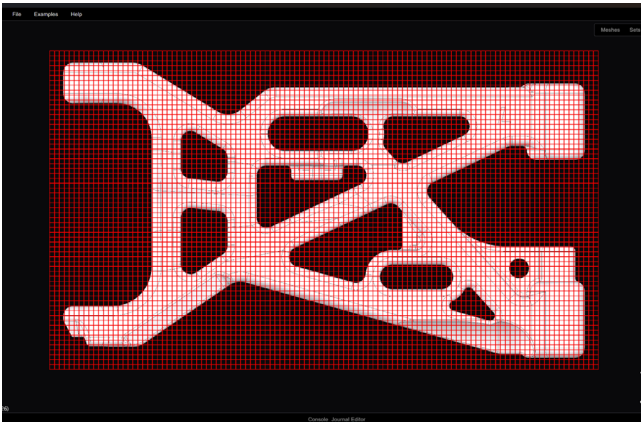
Coreform's solution would have to read native CAD data file as well as exchange formats like STEP, thus they needed high quality CAD geometry import capabilities. The reality was that traditional meshing capabilities needed massive engineering time and were simply a means to an end. By utilizing their innovative IGA solver technology, their simulation method sidesteps the need for traditional meshing and pre-processing. They knew they needed a robust and precise 3D geometry kernel capable of special Boolean preprocessing for this methodology.

SOLUTION

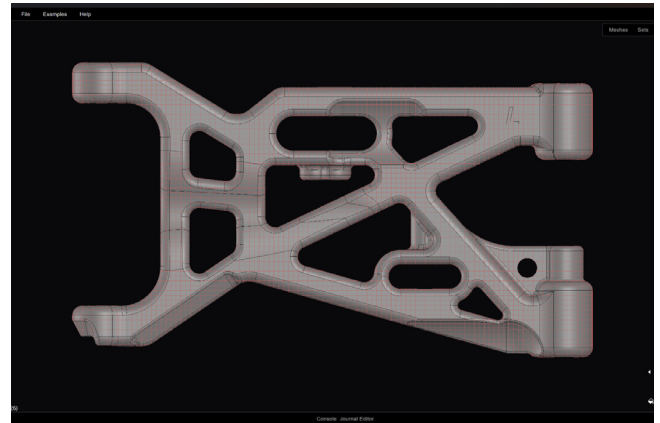
Customized 3D Modeler, Interoperability, and Meshing Solutions

Coreform had a long history with Spatial as a trusted partner since 2019. They saw Spatial as a leader in the CAD and CAE domain. Coreform's development team was already familiar with and capable of developing on top of Spatial Software Development Kits (SDKs) from their utilization in the Coreform Cubit software.

Coreform integrated Spatial SDKs to support all the pre-processing parts of the Coreform Flex workflow. For their meshing software, Coreform Cubit, Coreform was already licensing Spatial's 3D ACIS Modeler and 3D InterOp, and the legacy version of Meshgems. The preprocessor in their new IGA solver, Coreform Flex, uses 3D ACIS Modeler and 3D InterOp.



Untrimmed spline mesh overlay for Coreform Flex's meshing-free workflow.



Refined spline mesh using the ACIS geometry kernel for precise processing.

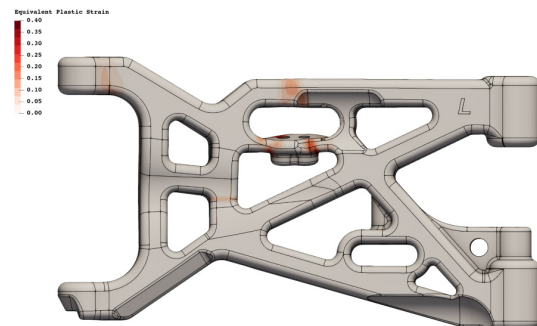
This 3D modeler would need to perform millions of face/face intersections and up to millions of edge/face intersections. The ideal right 3D modeler would allow Coreform to close the loop on time spent on non-value-added activities during the simulation and deliver on its promise to save its customers valuable time.

Coreform Flex directly uses CAD models in the simulation without defeaturing or conformal meshing, enabling real-time analysis.



“We were able to achieve better results with ACIS than we could have on our own, and their willingness to engage with us to meet our specific needs resulted in a product we are confident about delivering to customers.”

— Matt Sederberg, Coreform CSO



Simulation results highlighting plastic strain and structural response.

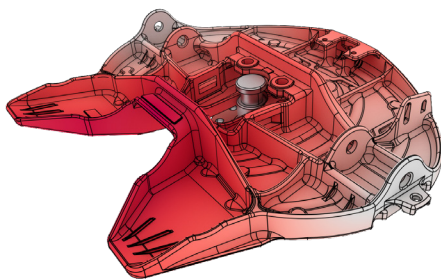
Innovative Use of 3D ACIS Modeler

The advantage of 3D ACIS Modeler in Coreform Flex is that it has low-level API (Intersectors) access that Coreform was able to capitalize on and implement in extremely high-performance intersections.

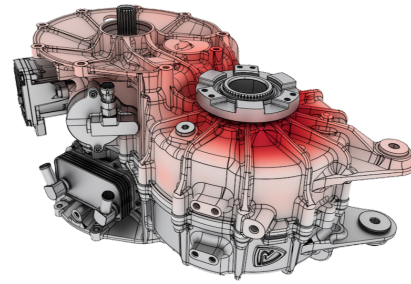
IGA technology is innovative and, therefore, requires the innovative use of the ACIS modeling kernel to enable the direct geometric processing deployed in the IGA solver. ACIS is the Spatial solution on which Coreform is most focused; it is used at a deep level and interacts with the core kernel representation for CAD data. Spatial and Coreform collaborated on the exact needs of the software and adapted 3D ACIS Modeler to meet Coreform's expectations regarding Boolean operations.

Bringing the Action Plan to Life

From the beginning of the project, Spatial provided Coreform developers with comprehensive support from Spatial technical sales managers and the ACIS R&D team. Spatial support was there to answer advanced questions and implement complex Boolean operations within ACIS. Spatial provided an internal ACIS developer with whom Coreform developers met daily to ensure support every step of the way. Coreform also contracted with Spatial for an extra service package to continue complex software developments.



Simulation of a fifth-wheel hitch engagement, developed in collaboration with Sandia National Laboratories.



Gearbox housing simulation showcasing advanced meshing and structural analysis.

Spatial enabled Coreform to obtain the required information early enough in the process that they were able to launch the product earlier than expected. Spatial's support team was engaged and willing to co-build with the Coreform developers and improve the software and evolutions.

By complementing their innovative technology with Spatial's cutting-edge solutions, Coreform's simulation technology dramatically reduces the investment in model building (i.e., mesh generation, CAD defeaturing, etc.), with no compromise on the results and precision. As a consequence, Spatial's SDKs help improve simulation accuracy and robustness for linear, nonlinear, static, and dynamic problems.

"The best things were (Spatial's) familiarity and in-house expertise, along with support, engagement, and response from the R&D team to address challenges encountered while developing Coreform Flex."

— Derek Thomas, Coreform CTO



KEY INSIGHTS

After implementing Spatial SDKs, Coreform entered into a new paradigm for generating computation models and simulated models. They anticipate this outcome being adopted by customers in a wide range of industries.

As a result of the fully built-out software, Coreform found that their customers' simulation engineers could save 80-90% of the time that they traditionally spent on meshing. This makes simulation a more reliable tool from a business perspective, and frees engineers to do more with their valuable time.



Learn more about Coreform
and their cutting-edge
isogeometric analysis
technology, Coreform Flex.

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application ahead of the
competition?

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About Spatial Corp

Spatial Corp, a Dassault Systèmes subsidiary, is the leading provider of 3D software development toolkits for technical applications across a broad range of industries. Spatial **3D modeling**, **3D visualization**, **3D Meshing** and **CAD translation software development toolkits** help application developers deliver market-leading products, maintain focus on core competencies, and reduce time-to-market. For over 35 years, Spatial's 3D software development toolkits have been adopted by many of the world's most recognized software developers, manufacturers, research institutes, and universities. Headquartered in Broomfield, Colorado, Spatial has offices in the USA, France, Germany, Japan, China, and the United Kingdom. For more information on Spatial's latest updates and product offerings, please visit www.spatial.com.



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