

Isight

Automate Design Exploration
and Optimization



Isight

Improve efficiency
Accelerate product design
Reduce manual errors

Industry Challenges

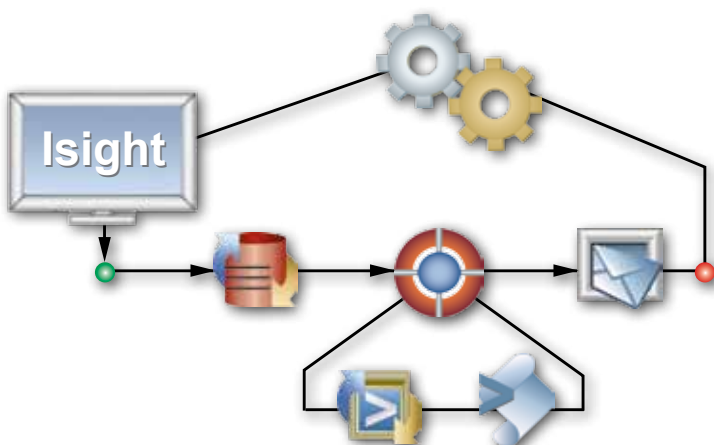
In today's computer-aided product development and manufacturing environment, designers and engineers are using a wide range of software tools to design and simulate their products. Often, the parameters and results from one software package are required as inputs to another package, and the manual process of entering the required data can reduce efficiency, slow product development, and introduce errors in modeling and simulation assumptions.

SIMULIA's Isight Solution

Isight provides designers, engineers, and researchers with an open system for integrating design and simulation models—created with various CAD, CAE, and other software applications—to automate the execution of hundreds or thousands of simulations. Isight allows users to save time and improve their products by optimizing them against performance or cost metrics through statistical methods, such as Design of Experiments (DOE) or Design for Six Sigma.

Isight combines cross-disciplinary models and applications together in a simulation process flow, automates their execution, explores the resulting design space, and identifies the optimal design parameters based on required constraints.

Isight's ability to manipulate and map parametric data between process steps and automate multiple simulations greatly improves efficiency, reduces manual errors, and accelerates the evaluation of product design alternatives.



Open Component Framework

Isight provides a standard library of components—including Excel™, Word™, MATLAB®, COM, Text I/O applications, Java and Python Scripting, and databases—for integrating and running a model or simulation. These components form the building blocks of simulation process flows.

The direct link between Isight and the components allows for easy modification of a reference input deck, execution of the component, and the extraction of the output information.

A full-featured development environment, based on Eclipse™, supports the development of components, whereas the open API extends additional Isight capabilities. This open architecture allows SIMULIA and its partners to offer a wide range of application components that provide a tighter integration with models developed in popular engineering software applications.

A component based approach makes it easier to create process flows, reduce maintenance costs, and provides timely access to new components or updates through an independent release process.



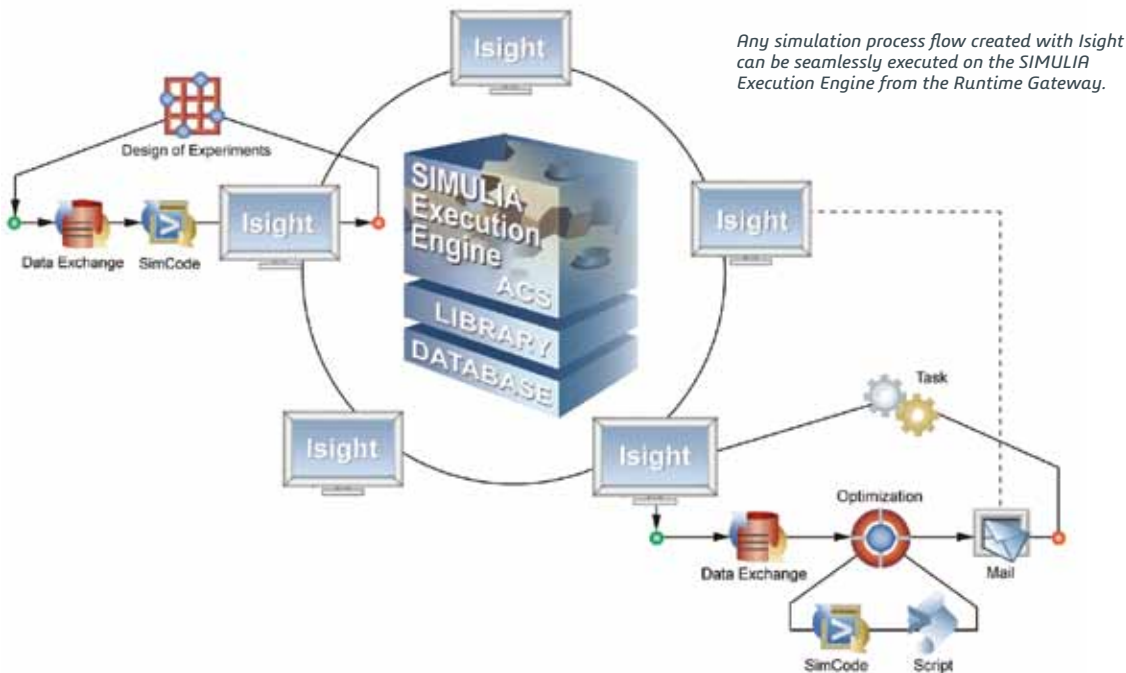
Simulation Process Flows

The intuitive Design Gateway graphical user interface enables users to quickly create integrated simulation process flows, which couple simulation programs regardless of discipline, programming language, or format.

Isight provides drag-and-drop process flow creation, parameter mapping, and problem formulation.

In addition, Isight delivers branching, looping, conditional, and other execution logic. This flexibility, combined with scripts to alter the runtime behavior of the model as a function of changing parameter values, allows the creation of highly reusable processes.

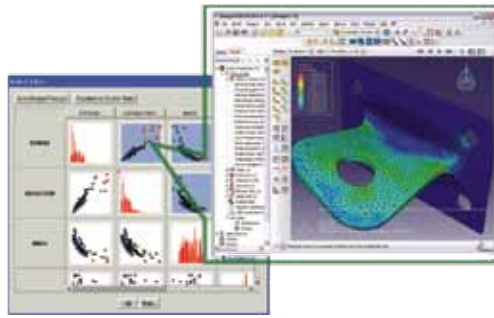
Once the process flow is defined, the user interface enables easy import of externally defined parameter values and problem formulations. Utilities such as model search, model content viewer, parameter search, and parameter grouping are also available.



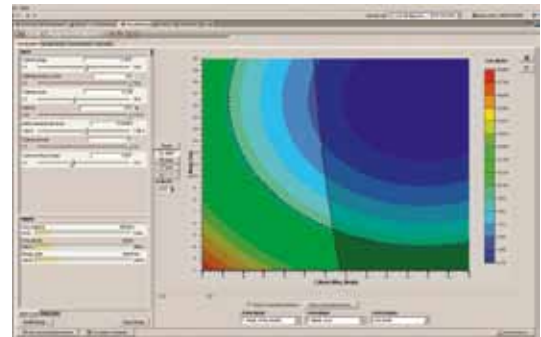
Execution, Results Visualization, and Postprocessing

The Runtime Gateway also enables local execution of engineering process flows. It also enables the creation of graphs and tables to visualize results. All job results are saved automatically to a locally managed MySQL database. The user interface supports the creation of visual tools for real-time postprocessing of data such as tables, 2D and 3D plots, and statistical analysis.

Isight provides interactive tools for visualizing parameter relationships as well as performance attribute tradeoffs with interactive approximations. Users can share these approximations with non-Isight users by exporting them to Excel.

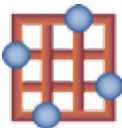


Point cloud scatter plots of simulation results with run grading. Abstract data, like a stress field computed with Abaqus, can be visualized with one click in its native viewer.



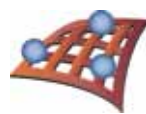
In the visual design driver you can trade off dozens of objectives with overlaid constraints in real time.

Isight offers an extensive library of parallel process components to enable engineers to thoroughly and quickly explore the design space.



Design of Experiments

The DOE component enables engineers to quickly assess the impact of various design variables based on a set of objectives and identify significant interactions. The design data produced by DOE runs can also be used with approximation models for use with optimization methods.



Approximations and the Visual Design Driver

Isight offers powerful real-time tools to interpolate results of computationally intensive realistic simulations. Approximation models are automatically cross-validated to ensure accurate predictions. The Visual Design Driver allows users to see their approximation models from many different views and “surf” the design space graphically and interactively.



Optimization

Isight provides a comprehensive selection of parallelized optimization techniques that can be applied to a variety of problems. It also includes techniques that can handle multi-objective optimization problems.



Quality Methods

Isight provides stochastic methods that account for variation in product designs and their operating environment. The Monte Carlo Simulation (MCS) component offers an accurate method to address uncertainty and randomness in the design process. It allows users to sample the design space, assess the impact of known uncertainties in input variables on the system responses, and characterize the statistical nature (mean, variance, range, distribution, etc.) of the responses of interest.



Data Matching

This process enables simulation models to be calibrated by minimizing any variety of different error measures using optimization techniques. Target data can be imported as experimental or simulation results.

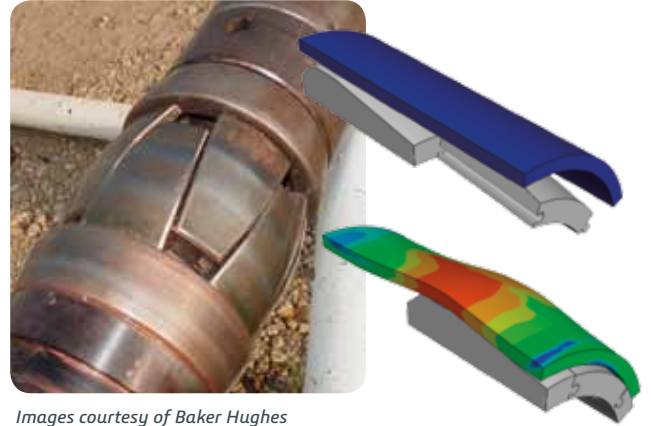
Baker Hughes Reduces Development Time from Months to Days

The use of expandable tubulars has emerged as a popular technology for drilling and completing wells. While expandable tubulars vary in type depending upon the application and specific well requirements, the most common approach is to actually form the metals downhole, which presents unprecedented challenges for tool designers. The costs and timelines to achieve a “workable” product can be tremendous. Baker Hughes has effectively leveraged realistic simulation to address these impediments and enhance their understanding of the mechanics and effects of nonlinear/dynamic expansion of metals.

Download the full paper at www.simulia.com/cust_ref

If we hadn't been using the software, the most effective cone geometry would have never been considered.

Jeff Williams, project engineer, Baker Hughes



Images courtesy of Baker Hughes

Rolls-Royce Assesses Variability to Achieve Robust Design

The airplane engine business is a highly competitive market and gas turbine engines are at the leading edge of technology development. In recent years, the application of optimization techniques and simulation-driven design during the development of engines has become a standard practice. To ensure the safe and reliable operation of the components and engine over the complete lifetime and in all operating conditions, it is important to look at the performance of the components at the nominal design definition stage, as well as to account for variabilities that may occur during the manufacturing process and product lifecycle. Rolls-Royce is using such techniques to shorten the development time of gas turbines and reduce development costs.

Download the full paper at www.simulia.com/cust_ref

Why did we implement robust design at Rolls-Royce? Because we realized, early on, that the sheer size and complexity of the aircraft engine design and development “problem” could only be mastered through a combination of simulation, process automation and optimization.

Alexander Karl, Lead, Robust Design, Rolls-Royce



The aircraft turbine is an extremely complex mechanical system. This photograph is reproduced with the permission of Rolls-Royce plc, copyright © Rolls-Royce plc 2009.

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SIMULIA is the Dassault Systèmes brand that delivers a scalable portfolio of Realistic Simulation solutions including the Abaqus product suite for Unified Finite Element Analysis, multiphysics solutions for insight into challenging engineering problems, and SIMULIA SLM for managing simulation data, processes, and intellectual property. By building on established technology, respected quality, and superior customer service, SIMULIA makes realistic simulation an integral business practice that improves product performance, reduces physical prototypes, and drives innovation. Headquartered in Providence, RI, USA, SIMULIA provides sales, services, and support through a global network of regional offices and distributors.

For more information, visit www.simulia.com.

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