BuildIT Software Solutions
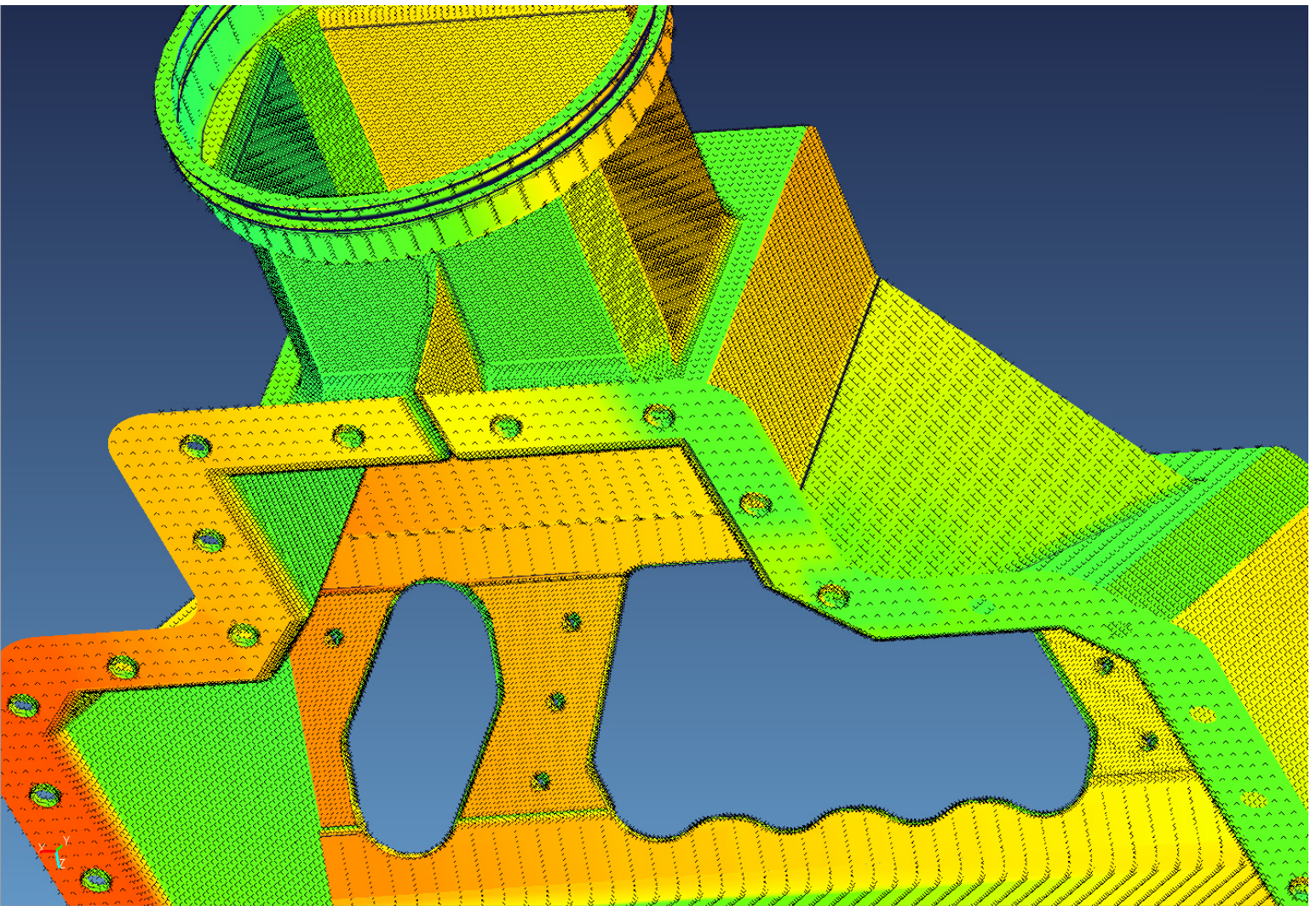
BuildIT Software & Solutions is a leading
developer of 3D model-based inspection software

BuildIT
made to measure

Market:
Portable metrology; reverse engineering; tool building; part inspection

Product:
3D ACIS® Modeler, 3D InterOp Suite, HOOPS

Challenges:
Needed a geometry kernel that would deliver higher levels of performance and provide advanced functionality for handling geometrical data.

Solutions:
- **ACIS geometry kernel to enable robust 3D modeling capabilitie**
- **3D InterOp translators for high quality import of native CAD files**
- **HOOPS to improve rendering and graphical display**

Results:
Spatial geometry kernel, CAD file translators, and graphical application framework will power BuildIT's next generation metrology software.

COMPANY

BuildIT Software & Solutions' core product, Build!IT, is a 3D model-based inspection software solution that enables companies to improve their manufacturing processes and product quality, while generating an increase in production savings. The software has evolved to keep pace with the current challenges in metrology, most notably the need for ease of use and compatibility with the most commonly used portable measuring devices.

BuildIT's portable metrology solutions are used around the world by quality inspectors and shop floor manufacturing workers in transportation (automotive, aerospace, shipbuilding); manufacturing (furniture, heavy equipment, machine tools, metal fabrication); energy (power plants); and specialty industries such as antennae, satellites and mold-making. Clients include BAE Systems, Gulfstream, Lockheed Martin and Northrop Grumman.

Key applications of Build!IT include measuring and alignment; tool building, inspection and calibration; reverse engineering and part inspection. Build!IT lets inspectors easily capture part data, compare it to a 3D digital model and produce graphical or tabular reports for cross-departmental review and analysis. Advanced capabilities include surface comparison plotting, dimensional based tolerancing, and GD&T based inspection.

CHALLENGE

BuildIT's software is based on the company's internally developed geometry kernel and the developers have reached the limits of the kernel's performance capabilities. The software has evolved over the past decade to improve functionality, performance and the user interface. In the process, the underlying technology has become unnecessarily complex due to an overabundance of legacy code.

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>
> *Mathieu Dubé-Dallaire,*
> *Engineering Manager, BuildIT*

In late 2008, acknowledging that developing innovative metrology software is the company's forte, the company began a search to source a geometry kernel that would deliver higher levels of performance and provide advanced functionality for handling geometrical data. The company also required unified CAD model importation (STEP, ProE, SolidWorks, etc.) and support for GD&T definition import (Catia FT&A, NX PMI), because it wasn't satisfied with its Datakit translation solution.
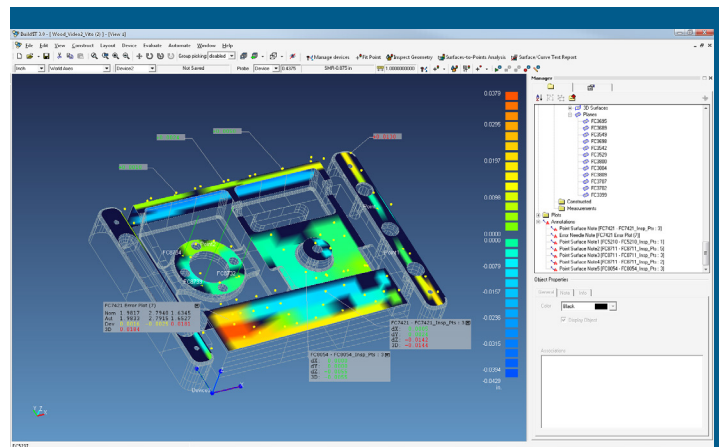
SOLUTION

BuildIT's software architect was aware that hundreds of companies were using Spatial's ACIS kernel to enable robust 3D modeling capabilities. After thorough technical evaluation, ACIS was ultimately selected because it met the company's requirements for ease of implementation, high performance, rich functionality and flexible licensing fees better than any other solution. After encapsulation and preparation phases, in September 2009 ACIS integration began.

"Another important factor in the decision-making process was the responsiveness of the Spatial technical support team to our inquiries and their willingness to work with us," said Mathieu Dubé-Dallaire, BuildIT Engineering Manager. "They go far beyond providing training, documentation and other typical technical support; they actively help us fill in holes in their offering if the need arises." For example point cloud support is very important to BuildIT customers, but wasn't part of the ACIS functionality. Spatial undertook the development effort and support for large point clouds is now part of the kernel.

Migration

In order to implement a new geometry kernel, BuildIT developers had to first unravel the software code to distinguish between geometry functions and the UI and metrology functionality. Within the geometry, surface representations were converted to ACIS. A new file format was created with MMX attributes and geometry, as well as SAT surface definitions. The company also implemented Spatial's 3D InterOp suite of CAD file translation tools for its support of a wide range of file formats and accurate file importation. Finally the developers converted and cleaned up best fit alignment and analysis routines to use ACIS projection code.

Workflow

Many functions of Spatial's components are used throughout the Build!IT workflow. Healing is used to close any gaps in imported surfaces to provide a bounded volume. The Faceter is used to generate a surface mesh, for improved graphic performance.. The model may need to be modified in various ways, such as adding reference geometry or removing unnecessary features. Build!IT then connects to the measurement device (point probe or scanner) to inspect all reference geometry. The device is aligned to the model using Spatial's offsetting or projection modules to calculate the distance from the measured point of the part to the CAD surface and all relevant geometry is inspected. Deviations between the part and the CAD data are analyzed and a report is generated to show problem areas.

BENEFITS

BuildIT's users benefit from higher performance, improved support for new and existing CAD formats and GD&T definition import. New capabilities such as the aforementioned support for large point clouds and support of a rollback mechanism for handling undo/redo improve ease-of use.

Other important ACIS capabilities include the quality of the tessellation engine and the performance gains achieved by using multiple threads for the projection of points to the surfaces of CAD geometry, an operation that is at the core of many functions BuildIT develops for metrology applications.

With Spatial, BuildIT's developers have gained advanced functionality on handling geometrical data, clear architecture (classes and derivations), Journaling and Scheme modules which are useful for validation and debugging, as well as a responsive support organization, robust documentation and an active developer community.

In addition to ACIS and InterOp, Spatial's 3D application framework, HOOPS, will be integrated with a goal to improve rendering and graphical display. Initial benchmarking results have been very positive.

RESULTS

The ability to import 3D file formats without the need to develop the technology internally proved critical to the development plans for ArtiosCAD. "The quality of Spatial's suite of CAD file format translators has helped us streamline the packaging design workflow," says Deroo. "Some of our competitors are still doing it the other way."

Spatial's CAD file format translators dramatically reduce the time it takes for ArtiosCAD users to prepare models for downstream use such as manufacturing and assembly of the final packaging articles. EskoArtwork's customers generally prefer using the native file importers such as Pro/E, CATIA V4 and V5, since these files provide higher quality translations than IGES and STEP formats can provide and eliminate any file translation errors going to an intermediate format.

"Our long-term partnership with Spatial helps us meet our aggressive product release schedule and maintain our leadership position in the market," continues Deroo. "We don't have to worry about keeping up with all the latest CAD file formats; Spatial ensures that we are up to date with the latest versions. In addition, InterOp's wide range of file formats has helped us expand our penetration into consumer product companies and POP display designers."

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