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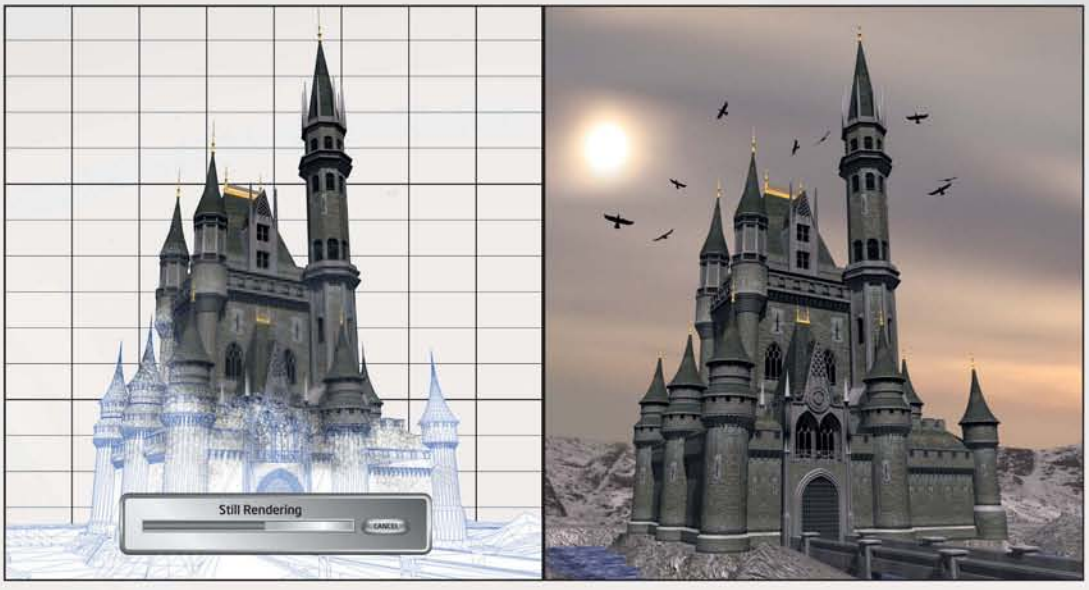


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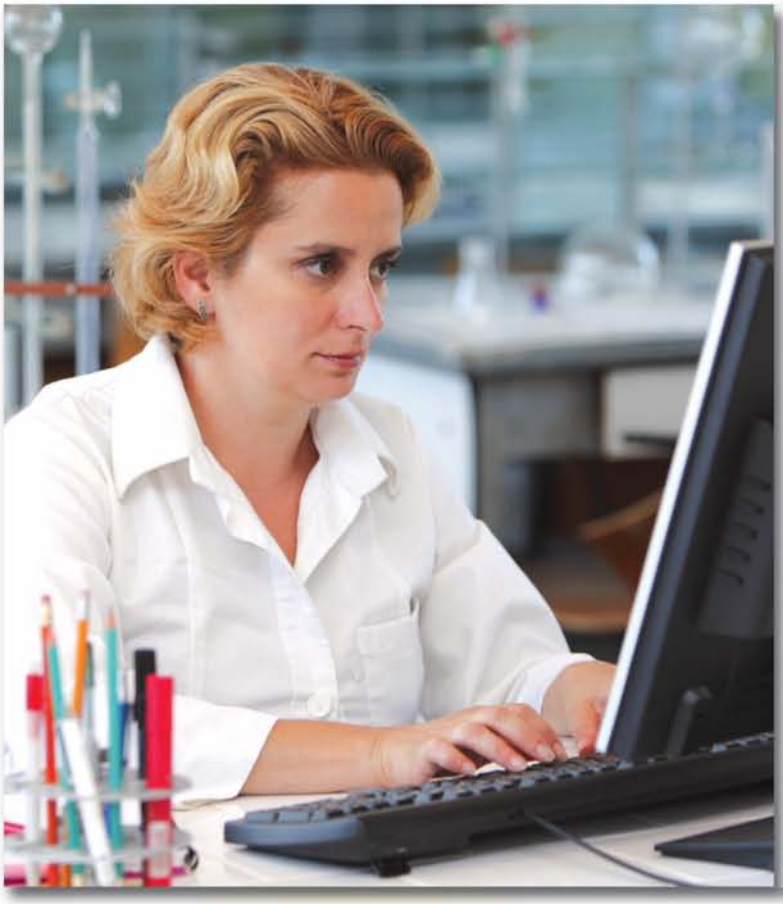

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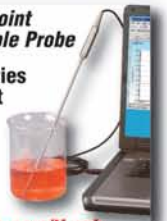

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# Technology Continues to Spur Engineering Innovation

STEVE ROBBINS
steverobbins@deskeng.com

The September 2010 issue you are holding in your hand is a very special magazine. It marks the 15th year we have been publishing *Desktop Engineering*. Back in 1995, John Hayes and Tony Lockwood left their secure jobs on DE's sister publication, Sensors, to take a chance at launching a magazine for design engineers. NT workstations had started to replace the UNIX Platforms and VAX clusters. The tagline on the first issue was "The Complete Computing Resource for Engineers." The lead story described what changes were taking place in the design engineer's world as desktops became more powerful. Software was well represented with analysis and virtual instrumentation leading the way.

Today we have massive computing power available to every engineer, with software and cores available on the cloud that are managed from the engineer's desktop. Our tagline has changed slightly to

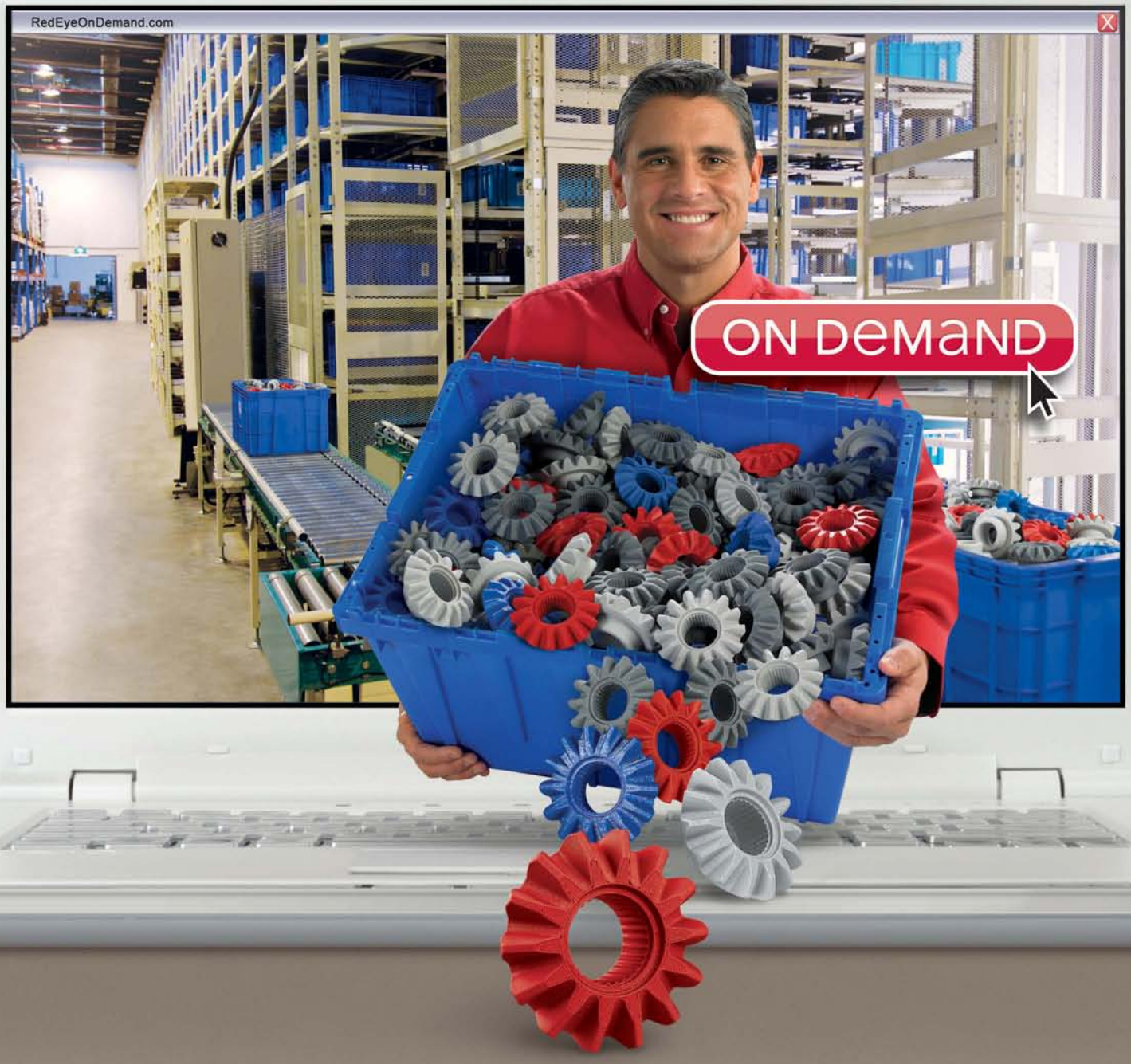
> "Our job is to help you do what you do best: create and innovate"

"Technology for Design Engineering," but our core focus over the years hasn't really changed at all. We exist because you need information that makes your job easier, and technology is still changing at a rapid pace. Our job is to help you do what you do best: create and innovate.

## Innovation In Action

A few weeks ago, I had the privilege of visiting Altair, a company that demonstrates the meaning of innovation. This engineering company has its roots in engineering consulting, and its management has a solid engineering origin. During this visit we were introduced to the BUSolutions project. A project like this could only happen to a team that was empowered to innovate.

Some engineers at Altair thought they could build a better city transit bus, and Altair management thought they could too. They

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have designed a bus that is stronger, lighter, and more fuel efficient. It also creates less wear on city streets and is easier to maintain.

A while back, I was lucky to attend a keynote speech on innovation by Dean Kamen, the inventor of the Segway. He explained that innovation doesn't start when management comes asking you for an innovative new design, then says you must use the old design as a model, that you have a budget of $800,000, and not a penny more, and the design must be completed in a year. Altair didn't do that. They started with a clean slate and turned their engineers loose to innovate. They empowered them.

Being there, seeing an aluminum bus frame hanging from a shop ceiling and all the different parts scattered around the floor with a group of excited 20-year-olds with grinders building something they knew would change the world of urban transportation was truly inspiring. You can see the full story on BUSolutions at Kenneth Wong's Virtual Desktop at deskeng.com/virtual_desktop.

## Looking Ahead

We believe in the innovative spirit. Desktop Engineering is here to enable that spirit. Being able to design with tools that empower you to create is important and valuable. DE's job is to give you the information you need to make decisions about the technologies you use on a daily basis, and we plan to be here for the next 15 years as a guide to those important decisions.

Check out our December issue where we will celebrate our 15 years by illustrating what an engineer's life was like in 1995 vs. today, and where technology is heading in the future. ■

***Steve Robbins*** *is the CEO of Level 5 Communications and executive editor of DE. Send comments about this subject to DE-Editors@deskeng.com.*




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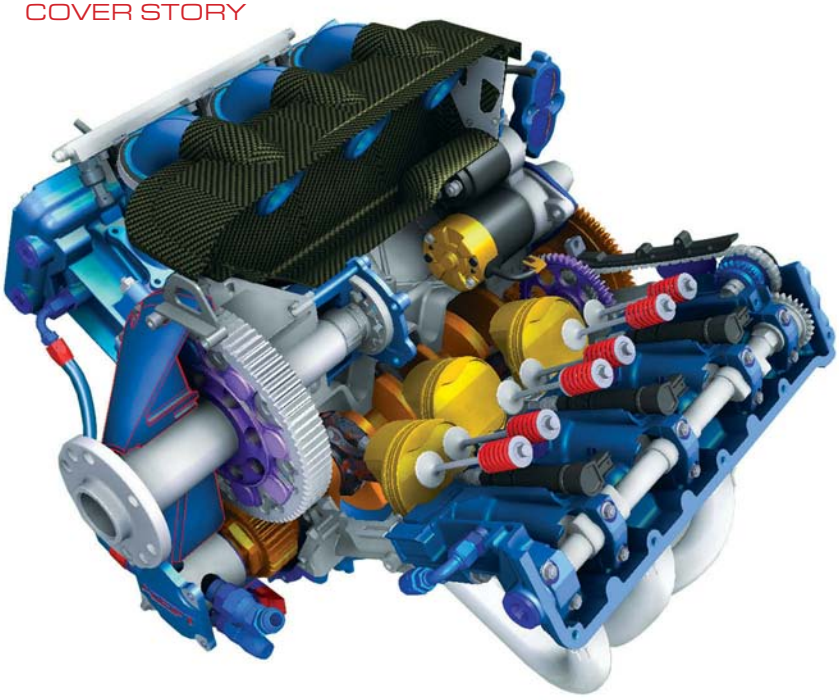
> Niels Bohr

COVER STORY



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### ON THE COVER >

Autodesk Inventor Professional Suite 2011 takes digital prototyping to a new level. Read David Cohn's review on page 26.

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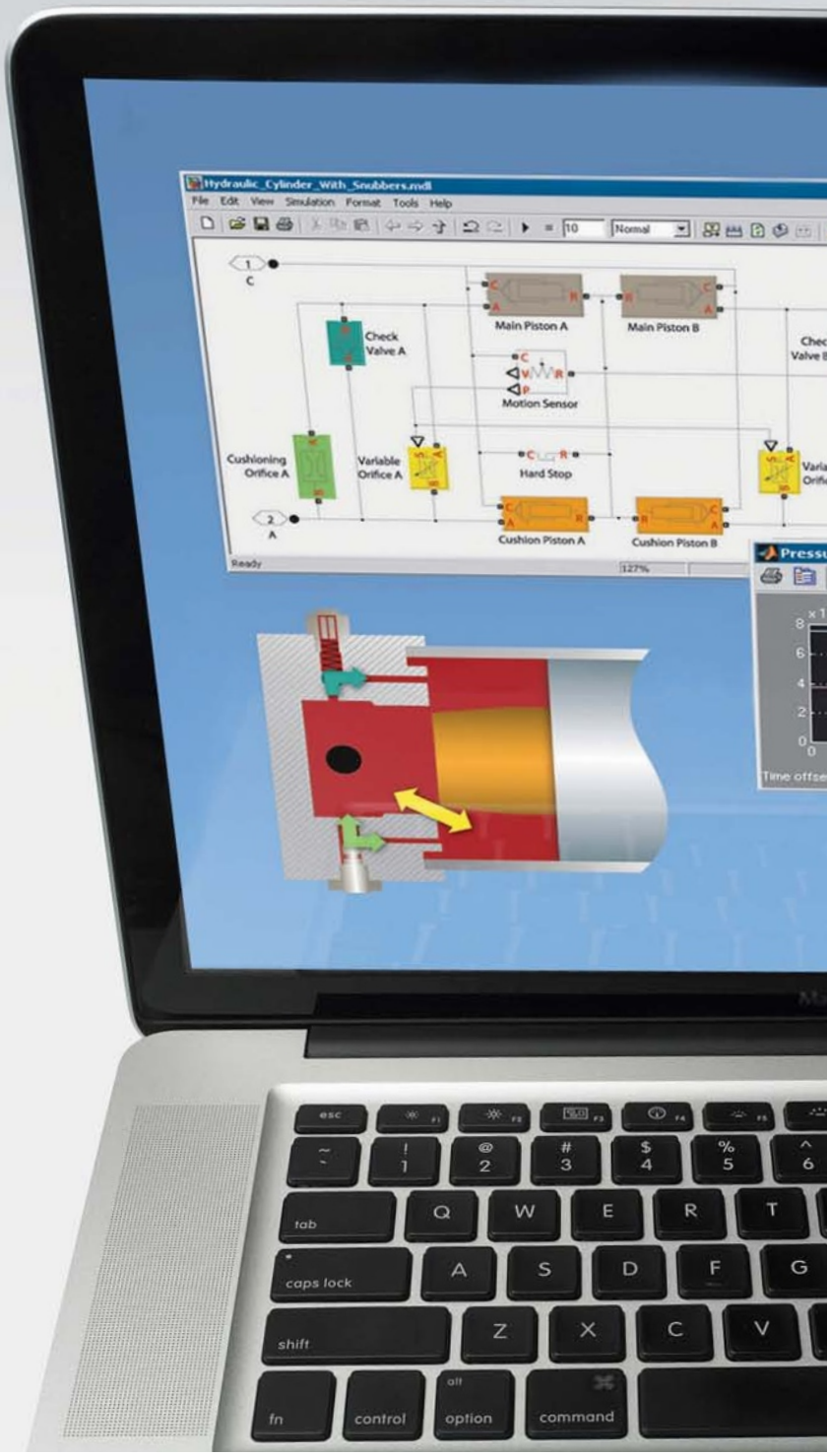


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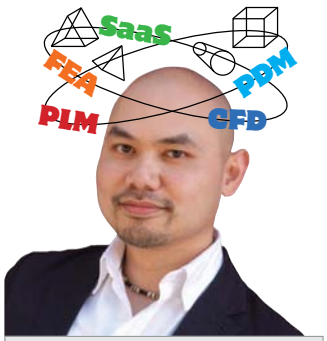
# Bunkspeed Shot vs. Luxion KeyShot 2

> Two rendering products emerge from Bunkspeed HyperShot technologies.

In the beginning, there was Bunkspeed HyperShot, developed and marketed by Bunkspeed (bunkspeed.com) and powered by Luxion's technology. But something happened to the licensing agreement between the two in November 2009, causing a split.




KENNETH WONG
kennethwongsf@earthlink.net

Bunkspeed offers the rendering program, rebranded as Shot, powered by mental images' iray rendering engine. Luxion (keyshot.com) now offers its own rendering program, branded KeyShot, powered by the company's original technology.

## What's the difference? Here are a few:

- Bunkspeed Shot uses hybrid CPU-GPU rendering. (mental images, Bunkspeed Shot's new rendering engine, is a wholly owned subsidiary of Nvidia.)
- Luxion's KeyShot remains CPU-based.
- Bunkspeed Shot is available only for Windows OS currently.
- Luxion's KeyShot is available for both Windows and Mac.

Bunkspeed Shot has a new look and feel. By default, the interface keeps the preview window and the rendering tools side by side. It also houses some features not found in Luxion KeyShot. For instance, you can turn on or turn off ray tracing with a single click. You may also use the ray brush tool to focus all your rendering horsepower on a single region, like a virtual magnifier.

KeyShot's interface is closer to the previous incarnation in HyperShot, particularly its use

**A Porsche with 710,000 polygons, rendered in Bunkspeed Shot at 2400 x 1350 pixel resolution, in Orange Metallic from the default material library.**

**A Porsche with 710,000 polygons, rendered in Luxion KeyShot Pro 2 at 2400 x 1350 pixel resolution, in Electric Blue material from the default material library.**

of floating pallets. Previously in HyperShot, you needed to use a bunch of complicated key commands to position the model or camera (for example, Shift + Alt + middle mouse wheel to rotate the model along the Y axis; Alt + left-click drag to dolly camera). In KeyShot, you can simply right-click on the model, pick Move, then use the directional arrow to drag and move it.

Bunkspeed Shot gives you the option to specify camera aspect ratio when you render. It also gives you more material and geometry grouping options than KeyShot.

In KeyShot, you can turn almost any material into emissive material via the Edit dialog box in Options. But no pre-made emissive materials come with the library.

For more, read Mark Clarkson's review of Bunkspeed Shot in the November issue, and watch my video reports at DEexchange.com. Clarkson will also review another rendering package, Luxology modo 401, in October. ■

# Autodesk Project Neon: Web-based Rendering

> Is this the future of rendering in the cloud?

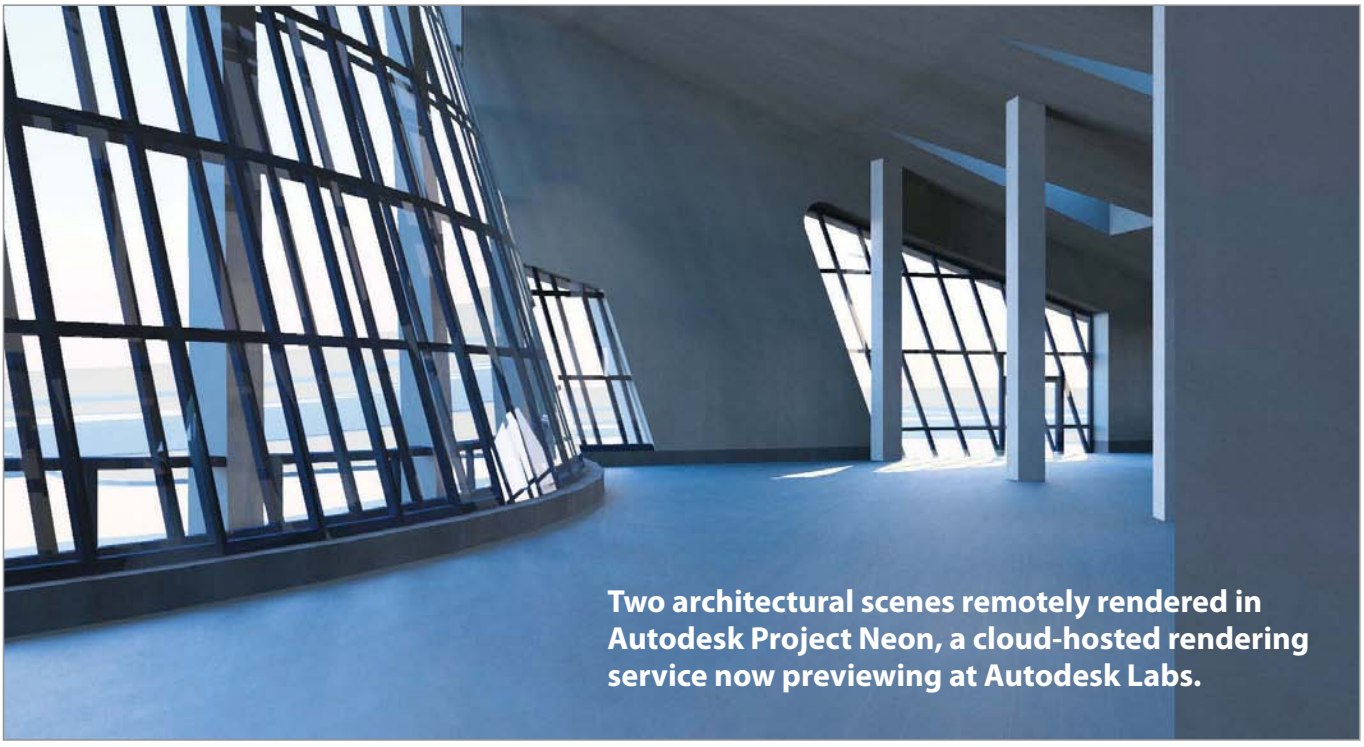
In my technology Utopia, this is how I might produce photo-realistic renderings, step by step:

1. I upload my scene to a remote server in a common 3D format.
2. I specify the output format I want.
3. I hit Render.
4. I download the high-res rendering.

The recently launched Autodesk Project Neon (neon.labs.autodesk.com) comes pretty close to my vision. Described as "a rendering service," Project Neon lets you upload your scenes saved as AutoCAD 2010 or 2011 3D DWG files, then render them into JPEG or PNG images.

I think Neon is a proof of concept, a preview of what's possible under the cloud-hosted model. The software provides four rendering settings: draft mode (grainy preview), standard, high and best. My renderings produced at "high" setting in Neon are nowhere near what you'd get with a specialized renderer like Bunkspeed Shot or Luxion KeyShot. But that's easily fixed with the right partnership between Autodesk and someone else.

One minor quirk I noticed with the premiere release of Neon: It doesn't save any uploaded files. So once you've grabbed your renderings from a session, even if you want to render additional views from the same file, you'll be required to upload that file again. In a commercial release, I'm sure



**Two architectural scenes remotely rendered in Autodesk Project Neon, a cloud-hosted rendering service now previewing at Autodesk Labs.**

# How do you capitalize on managing complexity?

**Automotive electronics supplier uses Teamcenter® from Siemens PLM Software to turn mechatronics complexity into corporate growth.**

Shenzhen Hangsheng is a leading supplier of automobile electronic products including AV entertainment systems, intelligent navigation, integrated car body control systems, and sophisticated vehicle alarms. The company is truly global with customers, suppliers, and facilities on four continents. Its products integrate mechanical, electronic, and software systems, as well as other technologies.

Hangsheng uses a number of software systems to enhance design efficiency, but none of these systems addressed the broader issues of product lifecycle management (PLM) effectively. Without a single PLM backbone, files were isolated and inaccessible, data re-use was difficult, and technical changes were implemented inconsistently.

Recognizing the importance of development to overall business success, Hangsheng used Teamcenter digital lifecycle management software from Siemens PLM software to integrate mechanical structure design, electronic circuit design, and software design into a common information platform.

## The result?

Since implementing Teamcenter as the foundation platform for all product development, Hangsheng has seen considerable improvements in design efficiency and quality, as well as significant product quality improvements. In addition to improved innovation efficiency, Hangsheng realized a 30 percent reduction in warranty claims. But most importantly, the company's new orders are up 10 percent – proof that its customers are seeing the value.



SIEMENS

Get the whole story on Hangsheng and other mechatronics applications at **www.siemens.com/plm/mechatronics.**

the service provider—whether it's Autodesk or someone else licensing Autodesk's technology—would let users store files they'd repeatedly use.

In the current release of Neon, you need to do quite a bit of preparatory work in AutoCAD. For Neon to be able to render your file, you need to set up the scene (in 3D, not 2D) with at least one source of light (the default light source won't do) and one named view (so Neon can use that to create the perspective you want). All your Xrefs and images—like the ones needed for material textures—must be included as an eTransmit package (.zip).

In my view, AutoCAD is not an ideal program for scene composition. It's not meant for easy repositioning of geometric objects, nor is it for previewing the effects of lights and shadows. I'm not sure that DWG is the right format for scene descriptions either. I believe these are just placeholders for better substitutes while Neon's creators refine it.

On the other hand, Neon could easily be delivered as an optional service or a Web-connected plug-in for Autodesk Inventor and Revit users. The ability to press a button and get a rendered view of your mechanical assembly or architecture scene in short order is appealing to many. Plus, there's one undeniable benefit to remote rendering: Your CPU won't grow sluggish or freeze up while you're rendering.

Despite its experimental nature and limitations, Autodesk Project Neon, I believe, exemplifies how rendering would be done in the future. This Neon is not the bright-lit Broadway finale we're waiting for. It's just the beginning. ■

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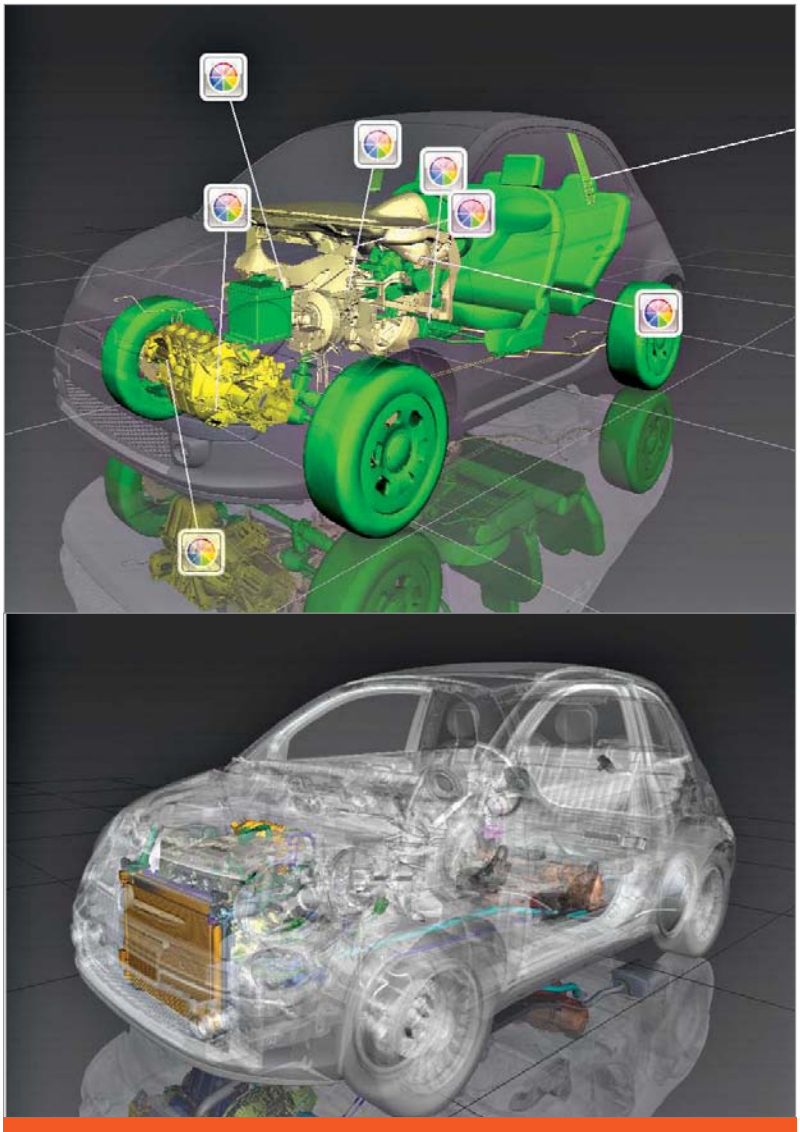
# Reports from Siemens PLM Connection 2010

> High-def product lifecycle management helps you spot trouble.

The news that broke in July at Siemens PLM Connection 2010 in Dallas was initially meant to break in the Grand Ole Opry in Nashville, TN, in May—a full month earlier. But two weeks before the scheduled event, the Cumberland River unleashed a flood. With the site of the event several feet under water, organizers had no choice but to relocate the conference. Consequently, the news Siemens PLM Software had originally planned to unleash almost simultaneously in China and the U.S.—first on May 20 at The World Expo in Shanghai, then on May 24 in America's country music capital—was released a month apart.

But you can't accuse the flood of stealing Siemens' thunder. Even long before the flood, the company had foretold what was to come. Siemens' HD3D, unveiled more than six months ago, was a precursor to the arrival of HD-PLM, or high-def product lifecycle management. (For more, read my blog post "NX 7 with HD3D," published in November 2009.)

With HD-PLM, the functions that used to reside in two separate windows—3D models in NX, product lifecycle data in Teamcenter—can be displayed in a



**In NX 7, the new HD3D setup allows you to display product and project data inside your assembly environment, turning the digital model into a data management platform.**

single, unified application window, inside NX 7. Want to see change orders that are overdue? Want to see all the electronic components supplied by overseas contractors? Want to see all subassemblies with unresolved compliance issues? No need to log into a separate PLM window. Your NX 7 assembly model is your window to the data housed in Teamcenter.

"Problems that are small are hard to find, but very easy to fix; problems that are big are easily found, but very hard to fix," observes Helmuth Ludwig, Ph.D., president of Siemens PLM Software. "The challenge is to find the problem when it's still small, to spot it when you can easily solve it."

Looking at lifecycle data on a 3D model does give you new insights you might not otherwise get from staring at columns of part numbers, expense reports, spreadsheets and pie charts. You might, for example, discover that a single door handle has been holding you back from meeting your deadline.

The difference between seeing the culprit door handle as a part number buried beneath rows of data (which is traditionally how PLM systems display data) and seeing it as a highlighted spot on your model (which is how it would come up in HD-PLM) is the same as looking for a landmark hidden in a series of latitudes and longitudes in a database and locating the same landmark in Google Earth's fully rendered 3D terrain.

Siemens' U.S. rival Autodesk has adopted a similar approach to product data management (PDM) with the latest release of Autodesk Vault. (See "Data Management Has a New Face," April 12, 2010.) Dassault Systèmes, Siemens' continental rival from Paris, also advocates a visual PLM navigation system, dubbed 3D Live.

Deep in the heart of Texas, where the prairie sky is wide and high, where everything from belt buckles to prime-cut beef beg to be big, the narrow confines of spreadsheet-style PLM interfaces are difficult to miss once you've seen Siemens' HD-PLM and its rivals' visual data-management efforts.

> For more on Siemens' HD-PLM, listen to my recorded interview with Paul Brown, Siemens' senior marketing director of NX, at deskeng.com/virtual_desktop/?p=2018. You can also view photos from the event at DEexchange.com/photo/albums/siemens-plm-connection-2010. ■

***Kenneth Wong*** *writes about technology, its innovative use, and its implications. One of DE's MCAD/PLM experts, he has written for numerous technology magazines and writes DE's Virtual Desktop blog at deskeng.com/virtual_desktop/. You can follow him on Twitter at Kennethwongsf, or send e-mail to DE-Editors@deskeng.com.*

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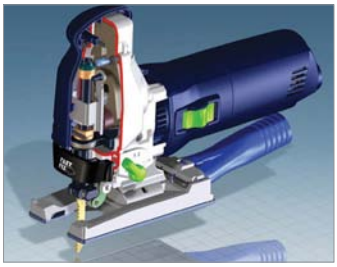
# EDITOR'S PICK OF THE WEEK

FROM THE DESK OF **ANTHONY J. LOCKWOOD**, EDITOR AT LARGE, *DESKTOP ENGINEERING*

WOULD YOU TRUST THIS GUY? Well that question has already been answered by thousands of readers who have indicated they already do, implicitly. So here are Lockwood's most recent musings about the products that have really grabbed his attention, and deserve yours.

## PTC Releases CoCreate

> Latest version offers more than 560 enhancements.



CoCreate was one of the first—if not the first—explicit modelers out there. It has been a technology leader for a long time. Version 17.0 offers more than 560 enhancements, many user-driven, across the product family, which means that there's a ton of stuff to learn about it. Your best bet is to hit the link to the Showcase video you'll find at the end of today's Pick of the Week write-up. But—ahem—never one to use few words when a zillion are possible, let me tell you of a couple of cool things in CoCreate 17.0.

One of the coolest aspects of CoCreate is that it uses the concepts and tools available in 2D yet drives people into adopting 3D. I'm not sure "drive" is really the correct word. Let's try "gently leads" users into adopting 3D. It does this by not fighting 2D and making you think different, as somebody once said. Rather, it takes your 2D comfort zone and makes it work in 3D. The upshot is that it gets the whole team up and running productively quickly.

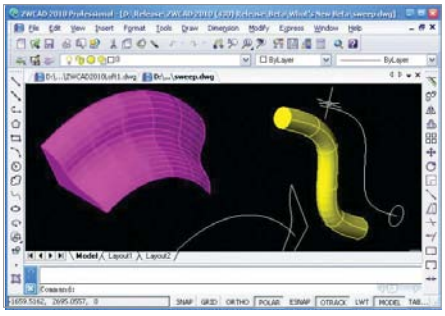
READ MY COMPLETE REVIEW:

**>CoCreate**

## ZWCAD

> Compatibility with AutoCAD formats extended.

Back in March, I wrote to you about ZWCAD 2010 saying that this might be the time for you to learn about this much-mentioned, low-cost alternative to AutoCAD. Recently, the company released an updated version of ZWCAD 2010, and my recommendation still stands.



ZWCAD is billed as providing "100% functionality for 90% of mainstream AutoCAD users." It supports 2D and 3D modeling, and is based on IntelliCAD technologies. The latter means it has native DWG format support. The newest version has been enhanced to support AutoCAD 2010 and 2011 formats, including DWG 2010.

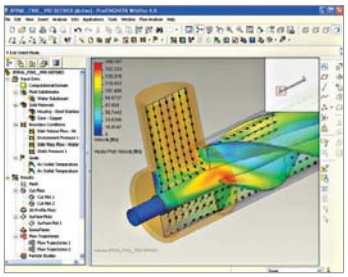
The 2D design version starts at $499 while the 3D version is $599. Toss in $200 and you have a year of no-charge technical support and a complimentary upgrade.

READ MY COMPLETE REVIEW:

**>AutoCAD**

# CFD Fully Embedded in PTC Pro/ENGINEER

> FloEFD Pro lets engineers design and simulate fluid flow heat, mass transfer concurrently.



Before its acquisition by Mentor Graphics, Flomerics—now known as the Mechanical Analysis Division of Mentor Graphics—built a name for itself with its powerful yet easy-to-use CFD software. A key to FloEFD has been that it allows you to optimize your designs quickly because it does not wear you down with all that figuring out complex numerical schemes and creating meshes. The just-announced FloEFD Pro v9.3.1 takes powerful and speed-of-use a step further by embedding fully within the Pro/ENGINEER Wildfire environment, letting you analyze and design concurrently.

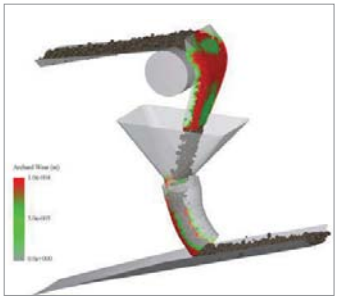
What does all this mean for you? Well, for one, FloEFD Pro lets you work within the Pro/ENGINEER Wildfire environment and with native Pro/ENGINEER geometry. No translations or that sort of fumbling around. But what this really means is that you maintain one set of data across your product design process, which will simplify everything dramatically. And, better yet, it means that you can play with your design, instantly analyze it, and generate multiple what-if analyses without a heck of a lot of fussing

READ MY COMPLETE REVIEW:

**>FloEFD**

# CAE Simulates Particle Flows, Bulk Material Handling

> EDEM enhanced with new tools for manipulating designs and visualization.



Simulating the processes and equipment for handling bulk materials such as coal, ore, soil, pellets, tablets, and powders is a bear. Each of those little particles is a variable in motion, interacting with one and other as well as a structure, causing reactions to reactions to happen all over the place. DEM Solutions specializes in simulation software for analyzing and optimizing the events, processes, and the equipment to deal with these phenomena, and the company has just released version 2.3 of its flagship software EDEM.

EDEM is based on the Discrete Element Modeling (DEM) technology. This physics-based discipline is designed to help you understand your systems' fundamentals by enabling you to simulate and analyze the flow of bulk materials. Once you understand what's going on, EDEM then helps you optimize your bulk materials handling equipment and processing operations through virtual prototyping and animated visualizations.

One of the cooler aspects of EDEM is that it is one of the few commercial applications that do this sort of thing. Most of the tools for this operation are academic or even home-brewed affairs.

READ MY COMPLETE REVIEW:

**>EDEM**

# New Component Roundup

> Bring your design components far forward with these new products.

With component choices moving further forward in the design cycle, many design engineers are realizing they need to become more familiar with sensors and other embedded components. Combining electrical and mechanical aspects earlier in the design process can boost efficiency by eliminating the back-and-forth between engineers. The products below can help you specify, test and measure designs. For more, visit deskeng.com.

## Meggitt Sensing Systems Releases Endevco Model 6222S

**Meggitt Sensing Systems'** (meggittsensingsystems.com) Endevco model 6222S series is a high-temperature piezoelectric family of accelerometers, designed for vibration monitoring in helicopter health and usage monitoring systems (HUMS), ground and onboard aircraft engine monitoring, and ground-based gas turbine engine monitoring applications.


The series is available in three models, with sensitivities of 20, 50 and 100 pC/g and choice of three connector styles.

## Kaman Releases High-Precision Sensors

**Kaman Precision Products** (kamansensors.com) offers a line of sensors and systems that it says provide accurate and precise non-contact position/displacement feedback in hostile environments. These inductive-based displacement sensing systems operate from –320°F to +1,000°F continuous and up to +1,200°F short term.

Kaman's extreme sensing systems use a dual-coil sensor design to minimize both thermal and radiation effects. The common mode rejection provided by the symmetrical design of the dual coils compensates for constant and slowly changing temperatures from -320°F to +77°F or from 77°F to +1,000°F, according to the company.

## Cymbet Releases Solid-State, Rechargeable Energy Devices

**Cymbet** (cymbet.com) EnerChip rechargeable solid-state energy devices are designed for energy storage and power management. Packaged as a surface mount technology (SMT) component, the EnerChip provides energy storage in a small form factor. Cymbet's EnerChip family is suited for applications where battery backup power is needed to maintain the settings of microcontroller memories, real-time-clocks and SRAM during power loss or power failures.

## Spectrum Sensors and Controls Releases New Sensor Selection Guide

**Spectrum Sensors & Controls** (SpecSensors.com) has published a selection guide highlighting its line of Precision Temperature Sensors and Probe Assemblies.

The new guide covers temperature sensing products designed for environmentally harsh or demanding applications. These sensors are manufactured to withstand extreme temperatures, with an operating range from -50°C to +500°C.

## Kistler Instrument Corp. Launches Electromechanical NC Joining Modules

**Kistler Instrument Corporation's** (kistler.com) NCFT Type 2157A series is an electromechanical servo press family, offering force displacement monitoring within assembly, joining and other single-channel control applications.

According to the company, the Kistler NCFT Type 2157A series incorporates an integral piezoelectric dual range tension/compression force sensor and charge amplifier, allowing modules to offer high-velocity travel, precision joining and process monitoring in ranges of 0.25 kN to 1 kN with practical repeatability of <0.005 mm. ■

## NI LabVIEW 2010 Released

**National Instruments** (ni.com) has announced LabVIEW 2010, the latest version of the graphical programming environment for design, test, measurement and control applications.

LabVIEW 2010 is designed to deliver time savings with new features such as off-the-shelf compiler technologies that execute code an average of 20% faster, according to the company. With LabVIEW 2010, the compiler data flow intermediate representation has been further optimized, and Low-Level Virtual Machine (LLVM), an open source compiler infrastructure, has been added to the software's compiler flow to accelerate code execution.

For field-programmable gate array (FPGA) users, LabVIEW 2010 delivers a new IP Integration Node that makes it possible to integrate any third- party FPGA IP into LabVIEW applications. It is compatible with the Xilinx CORE Generator. National Instruments also implemented more than a dozen new features suggested by users through the LabVIEW Idea Exchange, an online feedback forum.

# Robonaut 2 Prepares for Space Duty

General Motors and NASA engineers are preparing Robonaut 2 for its planned November mission to the International Space Station.

The engineering teams are validating some of the technologies on the humanoid robot, including advanced sensor and vision systems. GM engineers on site at NASA's Johnson Space Center in Houston are sharing their results with colleagues at GM's Technical Center in Warren, MI, so teams working on cars and trucks can develop safety technologies for the future.

Engineers in GM's Research and Development operations plan to use the findings to help develop technologies to make plants safer. R2's technologies also have applications for sensor development, such as enhancements to lane departure warning, side blind zone alert, adaptive cruise control and rear park assist.

**Chris Ihrke, senior project engineer for General Motors, disassembling an R2 arm to prepare for electronics upgrades.** *Photo courtesy of GM*


**The Robonaut 2 technology could be used to develop advanced safety systems for future vehicles, improved safety and efficiency in manufacturing plants.** *Photo courtesy of GM*

GM and NASA engineers have been working together on the R2 program since 2007. The partnership has generated 34 patents to date. Robonaut 2 even has his own Twitter account at twitter.com/AstroRobonaut. ■

# FASTApps

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## 3D Engineering Produces a 'Supercar'

> Creaform stepped up to the challenge of designing an automotive masterpiece with its Handyscan 3D line.

All design begins with an idea—but giving shape to that idea is more difficult.

Car industry veteran Luc Chartrand founded HTT Technologies Inc. in 2000 to pursue a single goal: to make a car that would "represent perfection in its design and its mechanical architecture." As a specialist in composite materials and a master at replicating exotic cars for the movie industry, Luc built a team of engineers and specialists and got to work.

From a scale hand-made design to a Styrofoam replica, the Pléthore LC-750 was taking shape. The team worked on their prototype for four years, carefully building an entire functioning car, from tires on up, by hand. The car was first presented at the Montreal Car Trade Show on January 19, 2007. As the round of trade show unveilings and press conferences continued, HTT was getting ready to move on to the production line.

> More info


## Autodesk Aids Vox Amp's Design Processes

> Iconic guitar amplifiers get an update, courtesy of digital prototyping and 3D visualization. BY DAVE CLARKE

Vox Amplification has been making iconic guitar amplifiers and musical equipment since the late 1950s. If you've heard any of the classic "British Invasion" records from the 1960s, you've likely heard Vox products in action.

Today, Vox has a research and development team of 15 engineers—three based in the United Kingdom and 12 based in Japan—who are responsible for developing new Vox product offerings. Until fairly recently, the team relied on a basic 2D drawing package for its design needs. It worked, of course, but it wasn't optimal. The team had to draw out every bit of geometry and changes to the drawings didn't automatically update. Plus, because the team couldn't effectively check for interferences, they'd have to build two or three physical prototypes. All of those limitations added time and costs to the design processes.

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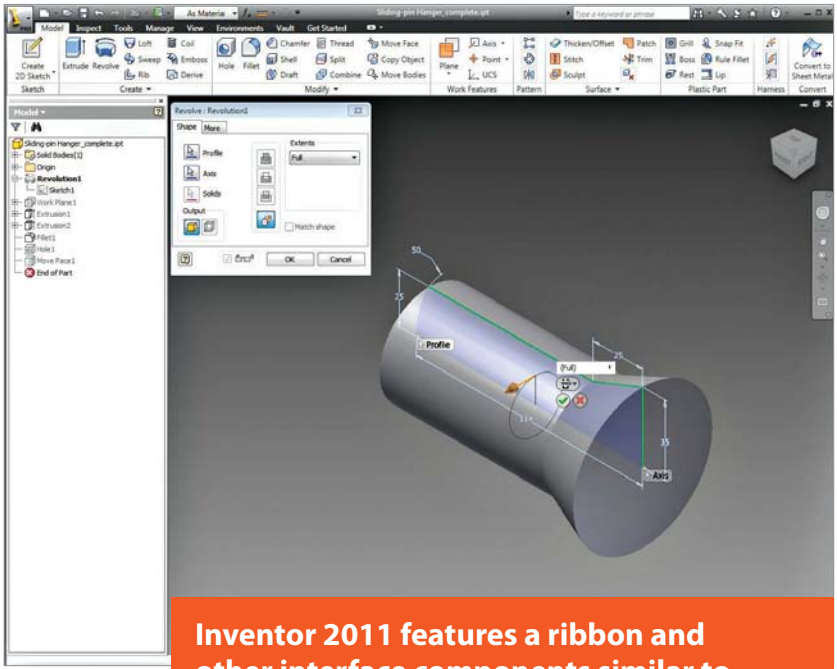
# Review: Autodesk Inventor Professional Suite 2011

> A wealth of new features and functions make the latest release one of the biggest ever.

BY DAVID COHN

A lot has changed since I last looked at Autodesk Inventor, so I will admit to being a bit nervous when AutoCAD Inventor Professional Suite 2011 arrived and I began to install the software for this hands-on review. The contents of the box itself seemed a bit daunting: There were nine DVDs, including Inventor, AutoCAD Mechanical, Autodesk Vault and Autodesk's Fusion Technology preview. But thanks to Autodesk's AIRMAX initiative—an internal project to standardize aspects of AutoCAD, Inventor, Revit and 3ds MAX—Inventor 2011 was immediately both new and familiar.



**Inventor 2011 features a ribbon and other interface components similar to other Autodesk products. Mini-toolbars and manipulators now appear directly adjacent to objects as you edit sketches and features.**

Like other Autodesk products, Inventor now sports a ribbon interface, along with an Application menu and Quick Access toolbar, those user interface components having been introduced in the previous release of the software. For example, commands that were formerly found on the Model Feature toolbar now appear on the Model tab. But Inventor 2011 also has some new interface enhancements of its own, including new dynamic input tools in the sketch environment, and direct manipulation mini-toolbars to access frequently used commands and options.

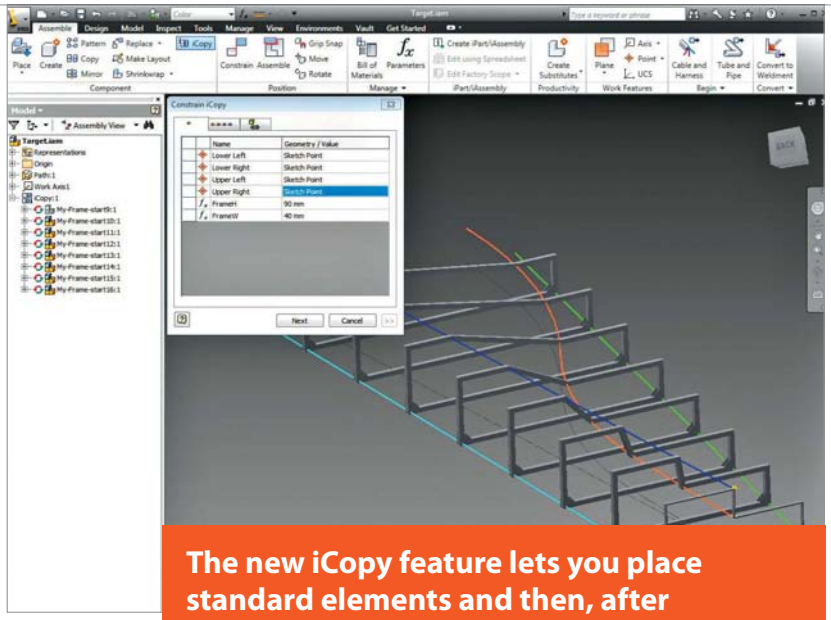
## Design It

Dynamic input in the sketch environment provides a heads-up display that lets you stay focused in the sketching area. Dimensions are automatically

created as you sketch, eliminating an entire separate step. When you start a command, such as to revolve a profile, Inventor displays a traditional dialog box—but now also provides an in-canvas display with mini-toolbars and manipulators directly adjacent to the sketch, which duplicate many of the controls found in the dialog box. As you work, the display immediately updates to show you a very accurate dynamic preview, so you can see the results of your actions before you complete the command.

Direct manipulation is object-oriented. For example, if you're not in a command and you select an edge, a mini-toolbar appears with options to perform a chamfer or fillet operation. After creating a part, if you select the part, a mini-toolbar gives you the option of editing the operation used to create that part or editing the underlying sketch.

Autodesk claims design time improvements of 40% thanks to these new tools. I didn't try to validate that number, but I did find the direct manipulation tools to be incredibly intuitive, greatly simplifying my reintroduction to Inventor.



**The new iCopy feature lets you place standard elements and then, after referencing a few key constraints, automatically creates multiple copies, appropriately sized based on their position within the assembly.**

## Visualize It

Another benefit from sharing technologies among various Autodesk products is the new visualization capabilities in Inventor 2011. All Autodesk products now use the same underlying graphics engine and the same materials library, so models created in one Autodesk product will look exactly the same if exchanged with users of another Autodesk product.

For Inventor users, the new visualization technologies mean that models can be displayed with enhanced shading, lighting and material displays—yielding near photo-realistic representations as you work, without having to stop to render the model.

Like AutoCAD 2011, Inventor now provides numerous visual styles—such as realistic, shaded, wireframe, monochrome, watercolor and illustration—that let you view models in a manner best suited for your task. You can also toggle shadows, both on the ground and on modeled objects, as well as control ground reflections that can show hidden features beneath a model. There's also a ground plane that can be toggled on and off, and adjusted to suit your needs and lighting styles. It lets you display parts and assemblies in various realistic environments.

## Assemble It

Once you've created parts, Inventor 2011 provides several assembly modeling enhancements. The new Assemble command is likely to become a

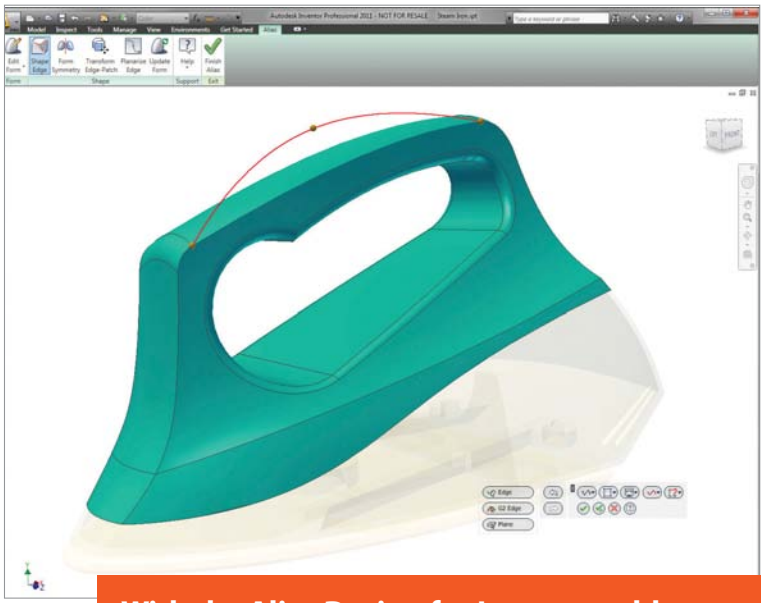
favorite of all users. It enables you to easily snap components together by selecting geometry on an incoming part, and then selecting a compatible geometric element on another part already in the model. Again, a mini-toolbar appears, offering a selection of valid constraint types inferred from your selection geometry. The Assemble command can be selected from the ribbon, but also becomes active whenever you place components. It supports the Mate, Flush, Directed Angle, Tangent, Insert and UCS constraints.

Another big change is the addition of constraint limits. These enable you to define the allowable range of motion for components that move or rotate. You can define a maximum, minimum and resting position value.

There's also a new Constraint Conflict Analysis tool that provides a dialog box to help resolve conflicting constraints by suppressing or deleting existing constraints, to quickly evaluate alternative assembly arrangements.

The new iCopy feature lets you place standard elements and then, after referencing a few key constraints, automatically creates multiple copies—appropriately sized based on their position within the assembly.

Autodesk has also improved the Shrinkwrap command. First introduced in Inventor 2010, Shrinkwrap converts an assembly into an envelope: a smaller, simplified part file that also serves to protect the intellectual property inherent in the full assembly. Shrinkwrap now supports active multi-body parts.



**With the Alias Design for Inventor add-on, users can integrate free-form shape modeling capabilities directly within the Inventor environment.**

## Simulate and Analyze It

Inventor has long been the center of Autodesk's digital prototyping portfolio, enabling customers to design, simulate and analyze products using a single digital model rather than having to produce expensive physical prototypes. Inventor Professional Suite 2011 expands upon the company's digital prototyping capabilities in a number of areas.

Inventor's frame generator enables users to sketch out framed structures, using members from a large library of standard sections. Enhancements in the 2011 release now let you define and reuse frame cross-sections. For example, you can sketch a notch profile, extrude it, convert it to an iPart, and save the new iPart to Inventor's Content Center. You can then apply the notch to cut another frame during the Notch process.

Frame analysis now lets users analyze and simulate

frames using static stress, to evaluate structural loading conditions and modal analysis to study natural frequency modes, including rigid body movements. The assembly is automatically converted into idealized nodes and beams, with the software guiding the user through the steps required to define the best testing scenario. After defining mechanical properties and applying loads and constraints, you can run the simulation and view the behavior relative to the conditions you defined. Results can be published as reports and recorded as animations, so you can see displacement and stress results. Frame analysis data can also be exported to RTD, the file format of the Robot Structural Analysis software that Autodesk acquired several years ago, to perform more advanced analysis.

When running a dynamic simulation, you can activate the new Simulation Guide to walk you through the steps required to define the best scenario to represent the particular loads or interactions. When performing analyses, you can also suppress part features not subject to stress concentrations, such as cosmetic rounds, to expedite the analysis.

## Other New Features

Of course, there are a host of other new features throughout this release that will appeal to various types of users. For example, Inventor 2011 can now import CATIA V4 models. Associativity is not maintained, but the imported model behaves as if it were created with Inventor. Inventor also now translates CATIA V4 file references in CATIA V5 assemblies.

In the realm of drawings, a big enhancement is

the ability to replace models referenced in a drawing. When you do, Inventor will recreate all views for the new model. And when you create a base view, you can now immediately create projected views relatively positioned to the base view, significantly reducing the number of steps required to place drawing views. You can also now create chain dimensions by placing a base dimension, then selecting individual points from the drawing view to insert and align additional dimensions.

Hatching has also seen some significant improvements. You can use hatch styles to control the default hatch properties in various types of views, and automatically break hatching around text in the drawing. And in another bow to the increasing use of Inventor by customers working in AEC environments, Inventor now supports architectural units, such as 1/4 in. =1 ft. – 0 in.

## Beyond Inventor

In addition to the new features and enhancements in the core Inventor 2011 software, the new release sees numerous changes to various modules included in the more advanced suites. Nowhere is this more apparent than in tooling and model design. Autodesk states that key workflow areas have been optimized to improve performance by more than 50%.

Inventor 2011 supports working with unique core/cavity, insert and core pin instances in pattern, allowing for instance-specific detailing of gates, runners and cooling channels. This enables users to automatically generate the mold core and cavity for a broader range of parts, whether based on native Inventor parts or imported files.

Inventor 2011 can now dynamically simulate the motion of mold base assemblies, enabling you to examine components for clearance and interference. When used with Moldflow, Inventor 2011 lets you graphically display air traps and weld lines directly in conjunction with simulation results, to help users gain a better understanding of their design and any underlying problems with the mold.

Autodesk has also taken advantage of the technology acquired from its purchase of Alias. When designs require more free-flowing forms, users can now leverage Alias Design for Inventor, a new add-on product that integrates Alias-based free-form shape modeling capabilities inside the Inventor parametric modeling environment. The resulting model is stored within the Inventor history tree as an Alias Feature. Unfortunately, Alias Design for Inventor is only available with a license for one of the versions of Alias, which start at $3,995 for Alias Design 2011, although you can download a free trial.

Another option is included in the box along with Inventor 2011, however. Autodesk Inventor Fusion is a technology preview originally available from Autodesk Labs. Fusion integrates both direct, history-free and parametric, history-based workflows, so that you can develop and manipulate designs using whichever method makes more sense.

Fusion is completely interoperable with Inventor. For example, you can open Inventor parts with Fusion, manipulate geometry directly, and then read the Fusion DWG file back into Inventor. You can then decide whether to accept or deny individual changes that were made to the model. Inventor Fusion also makes it easy to exchange data with AutoCAD and other 3D CAD systems.

Of course, Autodesk has also released new ver-


*Michael Wetter, Senior Designer, Link Manufacturing, Ltd.*

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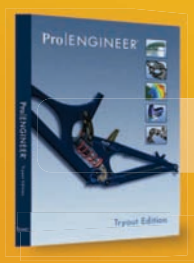


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sions of all of the other products in its digital prototyping portfolio, including AutoCAD Electrical ($5,295), AutoCAD Mechanical ($4,495), Algor Simulation ($7,995 for Basic, $14,995 for MES and $21,995 for Professional), and Moldflow ($4,995 for Advisor Design, $24,995 for Advisor Advanced, $34,995 for Insight Basic and $89,995 for Insight Advanced). And 2011 marks the commercial release of Inventor Publisher ($2,495), which had formerly been a technology preview on Autodesk Labs.

The AutoCAD Inventor Suite 2011 starts at $6,390 with a subscription or $5,295 without. Customers can also purchase other suites, such as Routed Systems, Tooling, or Simulation, at $6,995. The Inventor Professional Suite, which includes mold design, tube and pipe, cable and harness, dynamic simulation and FEA, is $9,290 with a subscription or $7,995 without. An upgrade from Autodesk Inventor Suite 2010 to 2011 is $2,645, and a standalone copy of Autodesk Inventor 2011 is $4,495.

Inventor 2011 is definitely one of the biggest releases in years, bringing a wealth of new technologies to the table while at the same time making the software more accessible to a wider range of users. This is quite a feat. With Inventor 2011, Autodesk has set a new standard for comprehensive tools at an attractive price point in the extremely competitive MCAD market. ■

***David Cohn**, a computer consultant and technical writer based in Bellingham, WA, has been using AutoCAD for more than 25 years and is the author of more than a dozen books on AutoCAD. He's a contributing editor to Desktop Engineering. Visit his website at DSCohn.com.*

## Autodesk

AutoCAD Inventor Professional Suite 2011

### >Price:

- AutoCAD Inventor $4,495
- Upgrade from Inventor Suite 2010: $2,645
- AutoCAD Inventor Suite: $6,390 ($5,295 w/o subscription)
- AutoCAD Inventor Routed Systems Suite: $6,995
- AutoCAD Inventor Tooling Suite: $6,995
- AutoCAD Inventor Simulation Suite: $6,995
- AutoCAD Inventor Professional Suite: $9,290 ($7,995 w/o subscription)

### >System Requirements:

- For parts and assemblies of less than 1,000 parts: 32-bit or 64-bit versions Windows 7, Windows Vista (SP2), or Windows XP Professional (SP3); a Pentium 4, Intel Xeon, Intel Core, AMD Athlon 64, or AMD Opteron or later (2GHz or faster); 2GB of RAM; and a Microsoft Direct3D 9 or 10 capable graphics card.
- For large assemblies (more than 1,000 parts): 64-bit version of Windows 7, Windows Vista, or Windows XP Professional; AMD64 or Intel 64 processor; 6GB or more of RAM; and a CAD workstation-capable graphics card.

### >Other:

16GB free disk space, DVD-ROM drive, Microsoft Mouse-compliant pointing device, 1,280x1,024-pixel screen resolution, Internet connection for web downloads and subscription-award access, Adobe Flash Player 10, Microsoft Internet Explorer (6.x or higher), Microsoft Excel 2003 or higher for iComponents, thread customization, and spreadsheet-driven designs.

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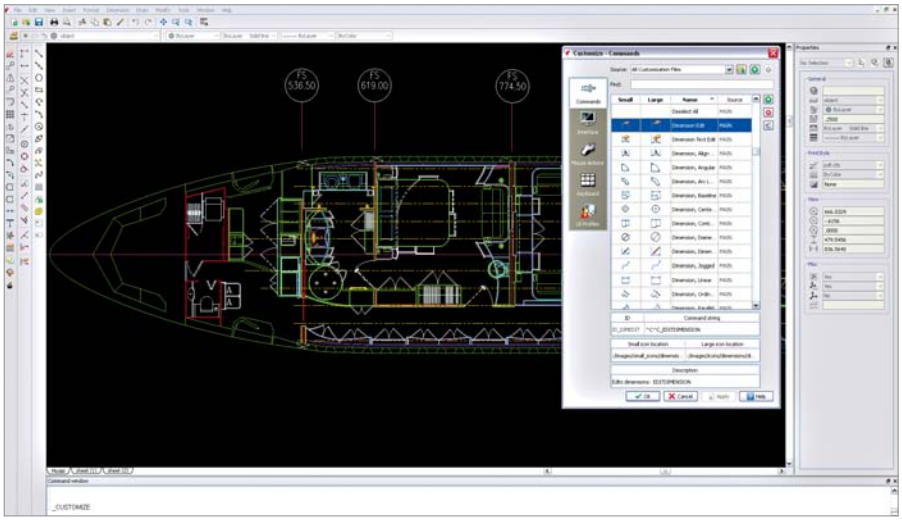
# Wallet-friendly 2D CAD

> ARES, DoubleCAD and ZWCAD (and a newbie) are Autodesk competitors that are chomping at the AutoCAD installation base at every opportunity.

BY JOSH MINGS



**ARES has a clean, simple interface and lots of options to easily customize the menus, toolbars, the mouse and more.**

You may not know it, but in the world of 2D design, you have a truckload of options for alternatives to Autodesk AutoCAD products. We're not talking about cheap knockoffs either. These are full-featured, actively developed 2D CAD programs. While keeping the AutoCAD look and feel, they bring their own set of options and functionality, their own improvements on the original, and best of all, a price coming in so much lower, it would be criminal not to look into how they perform.

ARES, DoubleCAD and ZWCAD claim to be better than AutoCAD. You'll see it on their sites in headlines and comparisons, but are they better? Let's take a look at these three very capable options in the space of wallet-friendly 2D CAD. We'll even throw in a little twist at the end that'll have you thinking about these options even more.

## The (CAD) Clone Wars

To get a better understanding of what these programs can do, there's a matter we should touch on briefly—where they all came from. Because all three claim to be alternatives to AutoCAD, there's no doubt they draw the core of their inspiration from the program. Often, these programs are referred to as "AutoCAD clones" or "ARX clones," ARX being the software development kit (SDK) that powers AutoCAD. However, all of these programs take their own path from the groundwork Autodesk laid with AutoCAD.

Here's how it happened. In 1998, Visio formed the Open Design Alliance (ODA) to make the DWG format open and accessible. In 1999, Visio divested the IntelliCAD 2D drawing product, formed the IntelliCAD Technology Consortium (ITC) and the first DWG development platform was available.

In 2002, the ODA introduced its own SDK called

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DWGDirect. There were now two DWG development platforms. Then, in 2006 the ITC, after distributing six versions, announced that version 7 would run completely on the ODA's DWGDirect engine. Four years later, it has yet to be released.

The ODA, in 2010, renamed DWGDirect to Teigha for DWG files so as to encompass all the compatibility, operating systems and third-party components available through its newly established Teigha platform. But even before all of this, AutoCAD clones were being developed.

In 1993, Berlin-based Graebert, after being cut off as a third-party developer for AutoCAD by Autodesk, began development on its own platform. In early 2010, after five years of development, Graebert launched ARES, a platform with its own SDK that resides as a wrapper around the ODA SDK. Graebert, it should be pointed out, is also a founding member of the ODA.

DoubleCAD is from California-based IMSI/Design, makers of TurboCAD. DoubleCAD is built on the same TurboCAD platform, and uses DWG read/write functions from the ODA SDK. Interestingly, Mauritz Botha, DoubleCAD CTO and lead developer, is the current ODA chairman.

That leaves ZWCAD. ZWSoft, located in Guangzhou, China, launched ZWCAD in 2002. It uses the ITC version 6 code base and has developed its own SDK: ZRX. It wraps around the ODA dev platform while still accessing ITC code.

## What to Expect

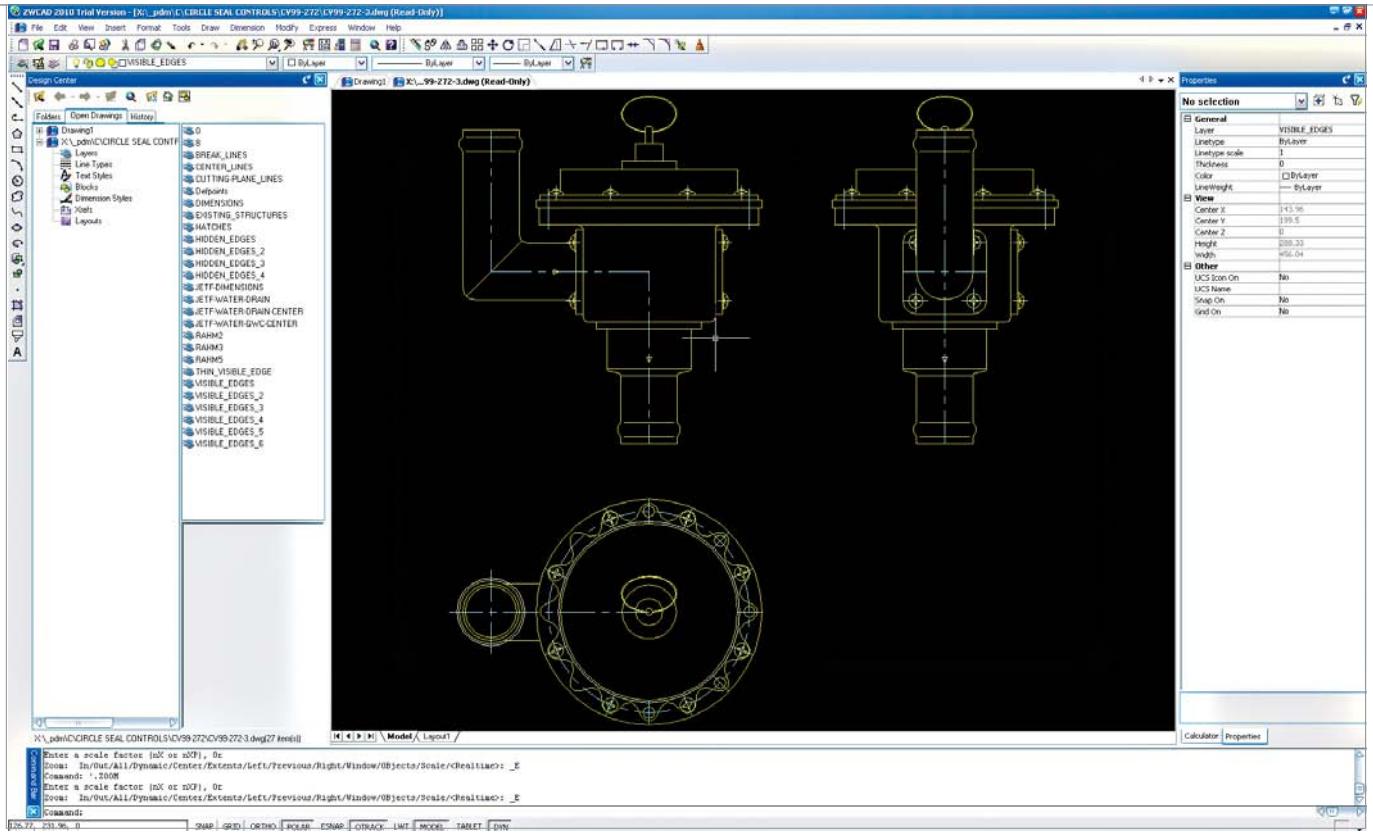
There is certainly a level of expectation when it comes to the capabilities a drafting program has. The first thing you'll notice if you were to run all three at once is the start-up speed and interface of ARES. It's fast and clean. It also has the smallest download at 41MB, where ZWCAD rings in at 139MB and DoubleCAD at 152MB.

They all provide the same basic set of functionality, from drawing tools and modifying tools to blocks, layers, templates and dimensions. However, each has ways of improving upon these standard tools. While none make an outright attempt to emulate the AutoCAD interface or the modern ribbon bar navigation (thank goodness), there's enough similarity to make anyone familiar with AutoCAD feel comfortable with banging away at the command line or accessing commands via the toolbar.

All handle legacy DWG data relatively well, all the way back to AutoCAD 2.5 and up to AutoCAD 2009—with each having plans for 2010 support. Windows 7 support is also available for all three. Each company offers two versions, the standard edition being a stripped-down version of the professional edition. Let's focus on the lower-priced standard editions and point out specifics that may interest you about the professional versions:

## The Smooth: ARES

With ARES, you're off and running. The program starts up quickly, has a clean user interface (UI) and provides all the familiarity of classic AutoCAD needed to start dropping draft lines and dimensions across the screen. Like AutoCAD, the display area provides model space and paper space to help divide up your workflow, but you also have the option to turn it off. The toolbars are similar



**ZWCAD brings speed to the drawing environment, and sports a Design Center to access libraries and attributes in other open drawings.**

enough to other drafting programs—and intuitive enough to figure out for those without 2D drafting experience.

What really stands out about the ARES interface, though, is the ability to customize it. If you need a new menu, simply right-click on the menus to bring up the customization options and have at it. It's the same with toolbars, keyboard shortcuts and mouse commands. Everything is easily customizable, all the way down to the image.

ARES even has some 3D capability. You can view 3D, use lighting, shading and materials. AutoCAD LT can't do that, but like AutoCAD LT, ARES doesn't come with support for LISP, DCL, DRX, C++ or ActiveX. For that, you'll need to move up to ARES Commander.

ARES runs $495, whereas the ARES Commander Edition comes in at $995 for the programming and 3D ACIS modeling. Those are really the major differences between the two—except one other thing: Mac and Linux versions. If you're a Mac fan or Linux fiend, this is exciting. It's currently in beta and only available for ARES Commander Edition. This will be the first native DWG support on the Mac and Linux platforms.

Bottom line: ARES is lightweight, fast and easy to customize. And if Mac or Linux is your thing, this will be the one to watch.

## The Free: DoubleCAD

DoubleCAD is definitely a different creature. While it has the 2D capabilities of all the others, it's not trying to blow AutoCAD out of the water. What it does blow out of the water, though, is AutoCAD LT—and anyone else who is currently putting 3D into a mainly 2D product. With IMSI/Design's

background in TurboCAD, it's no surprise this program is able to do what it does.

For example, its drawing tool has a handy input for length and angle that makes it much faster to create the desired line segments. Selecting objects enables handle-based editing where rotating, moving and sizing can be done all together. DoubleCAD also has a Smart Dimension tool, which allows you to quickly dimension geometry without having to go back and forth between dimension tools.

Those three features alone add up to increased drafting efficiency, but there are a couple other features of note. Getting smooth shapes that can be modified are simple with DoubleCAD's Bézier curve tool, and having the ability to convert polylines to Bézier curves makes it even nicer.

DoubleCAD also has the largest set of file compatibility options, sporting the ability to import and export SketchUp SKP files and CGM files. All of that and more in DoubleCAD XT for free, but once again, the professional version is where you get more options.

DoubleCAD XT Pro comes in at $695 (bundled with Corel Designer Technical Suite). It adds import and export for OBJ, 3DM, 3DS, SAT, STEP, IGES and WRL, among many others. It also has an abundance of preset architectural tools and provides parametric constraints for geometry. Neither one has Lisp support, but it does have its own software development kit (SDK) for plug-in and custom tool creation.

Bottom line: The extras in DoubleCAD and the fact that the standard version is free definitely put this in "immediate download" status.

## The Familiar: ZWCAD

There's a lot to be said for a drawing program that allows you to open drawings and move around them with ease. ZWCAD crushes here. It's smooth. ZWSoft has increased the speed at which you are able to zoom, pan and switch between sheets. The benefits are also seen with larger, more complex drawings where you may piling on the layers, sheets and external references.

ZWSoft has also done a lot to reduce the monotonous tasks associated within 2D CAD. There's a whole menu section of Express Tools that help manage layers and blocks, set up and modify dimensions, and customize text. This is made even better by being able to customize keyboard shortcuts to evoke Express Tools.

Another pain-easing feature ZWCAD boasts is the Design Center. This tool allows you to access your design libraries, dimension and text style or other attributes used across your drawing from within the program.

ZWCAD is the closest to having the most advanced AutoCAD functionality you'll see among these three. The standard version, at $499, provides Lisp and C/C++ *application programming interface* support. That's great if you have a directory full of AutoLISP you want to port over. The Professional version for $599 adds Visual Basic for Applications (VBA) support, basic 3D (ACIS) modeling and rendering. The modeling is nothing special, but the VBA is important if you need to transfer programs.

Bottom line: ZWCAD brings the familiarity and features that will ease the transition between it and AutoCAD.

## The Twist: DraftSight

I just can't write a review about low-cost 2D CAD options without mentioning DraftSight. In fact, I suggest sitting down as you read this next part.

DraftSight is a free 2D CAD tool... based on the ARES platform.

Everything about DraftSight is ARES, right down to the UI, options and customization. It's being developed by Dassault Systèmes, the parent company of the CATIA, SolidWorks and 3DVia product lines. Dassault has formed a DraftSight community around it, and has plans to extend the capabilities through plug-ins and API.

This is a fresh product, hot off the press as of June 2010. There's no professional version of DraftSight, but Dassault will offer a commercial license that allows access to API and customer support for $250.

Bottom line: If you're considering the ARES standard version or just want to have a free, unrestricted license of a 2D drafting program to view, create and modify 2D geometry, DraftSight definitely deserves a look.

These are just four options, but as you can see, they're very capable options that bring all the functionality of AutoCAD LT and, in some cases. Best of all, they come in hundreds, even thousands of dollars less. If you're not familiar with AutoCAD, these offer as many ways to fill your head with 2D CAD command sets and tool functionality as any other. They all have specific differences, but they all provide full draw, modify and dimension features.

No matter which way you go, you will come out with more features and more money than if you choose the $1,200 AutoCAD LT. They also take on new approaches to speeding up the design workflow—and that's the kind of talk that makes saving a little cash much, much sweeter. ■

### Info

**> Download**

- Ares: 41MB
- ZWCAD: 139MB
- DoubleCAD XT Pro: 152MB

**> Price:**

- ARES: $495
- ARES Commander: $995
- Graebert.com

- ZWCAD Standard: $499
- ZWCAD Professional: $599
- ZWCAD.org

- DoubleCAD XT Standard: Free
- DoubleCAD XT Pro: $695
- DoubleCAD.com

- DraftSight Standard: Free
- 3DS.com/products/draftsight

FOR MORE INFO:

**> Digital INFO**

***Josh Mings*** *is a design engineer working in the VIP aircraft interior industry. He also runs SolidSmack.com, which covers technology and design in the CAD industry. Contact him at josh@solidsmack.com.*

# Proper configurations boost your performance for ANSYS

> Make Sure to Configure Your Workstation Correctly to Get the Most from ANSYS 12.1

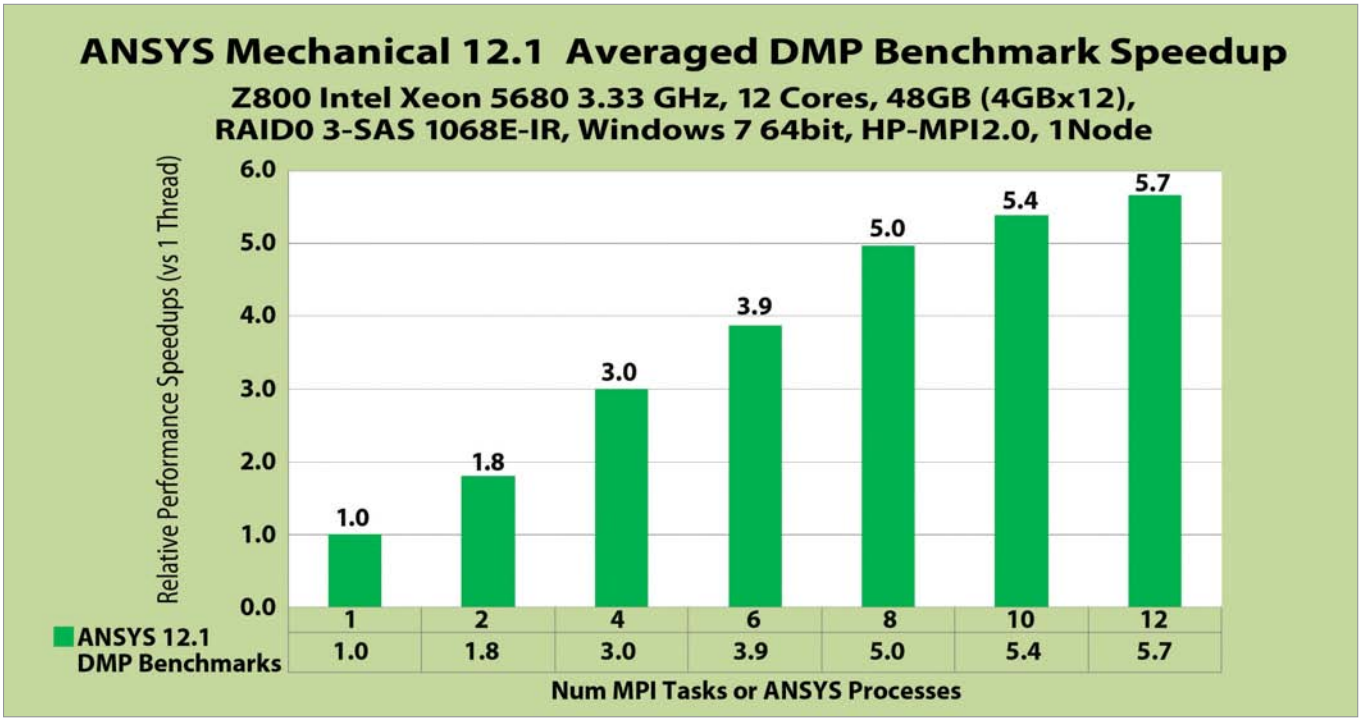
FEA SPECIAL REPORT

BY ANDREW PRIESTLEY

For today's most challenging structural or fluid dynamics analyses using ANSYS, server-level computing power has typically been a requirement. New technologies are changing this, putting the processing power, memory, disk performance and graphics capabilities required by ANSYS into a more affordable, flexible package, the HP Z-Series workstations.

## Getting the most out of your HP Z-series workstation in an ANSYS environment

ANSYS 12.1 is a demanding engineering platform with immense capabilities. Platform performance is the key to productivity. So here are a few tips to getting the most out of your ANSYS desktops.




**Speedup results for the ANSYS benchmark suite show that you could improve throughput by 5 - 6 times on workstations using the latest Xeon processors.**

## Processor speed and settings

ANSYS features excellent parallel processing capability, thus multiple cores and fast processor clock rate are both important, and the latest 6-core Intel Xeon processors offer fast clock speeds and multicore power. The HP Z800 Workstation comes with dual socket motherboards, with both sockets filled with 6-core Xeon processors, ANSYS users can experience the power of 12 high performance cores at their desktops. Large CPU cache found in Xeon processors helps a great deal as well, keeping throughput smooth and clean. Finally, BIOS settings should be set for the highest possible performance to take advantage of the innate performance of the architecture. To get the best ANSYS setting check the HP Performance Advisor, which ships at no additional charge on all HP workstations, to make the appropriate BIOS adjustments.

## Memory is key

Application code and file data should reside in physical memory for optimal ANSYS 12.1 performance so memory capacity should be sized to meet your projected needs. Memory sizing and configuration can be set to maximize system performance. HP provides memory white papers to guide your memory configuration and selection, and provides memory monitoring tools so that you can manage your ongoing memory needs as you put your HP Z800 workstation to use solving your most difficult problems. ■

## More Info

Other components are also important to configure correctly. There is a better way. And with today's high-performance HP Z workstations, design engineers are finding it.

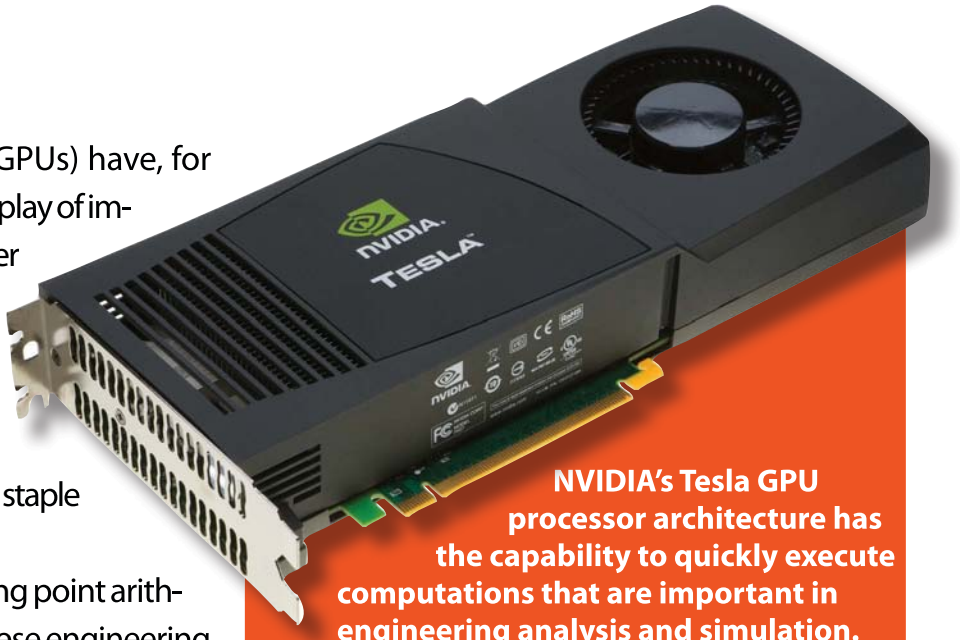
*For more information on an HP & ANSYS Solutions please go to www.hp.com/go/solver or call 800-888-0261.*

# GPU vs. CPU Computing

> When your time is on the line, you need both types of processors.

BY PETER VARHOL

Graphics processing units (GPUs) have, for many years, powered the display of images and motion on computer displays. GPUs are now powerful enough to do more than just move images across the screen. They are capable of performing high-end computations that are the staple of many engineering activities.




**NVIDIA's Tesla GPU processor architecture has the capability to quickly execute computations that are important in engineering analysis and simulation.**

Benchmarks that focus on floating point arithmetic, those most often used in these engineering computations, show that GPUs can perform such computations much faster than the traditional central processing units (CPUs) used in today's workstations—sometimes as much as 20 times faster, depending on the computation.

But the performance advantage in these benchmarks doesn't automatically make it a slam dunk for running engineering applications. Comparing CPUs with GPUs is like comparing apples with oranges.

## GPU Challenges—and Rewards

The GPU remains a specialized processor, and its performance in graphics computation belies a host of difficulties to perform true general-purpose computing. The processors themselves require recompiling any software; they have rudimentary programming tools, as well as limits in programming languages and features.

These difficulties mean applications are limited to those that commercial software vendors develop and make available to engineering customers, or in some cases, where source code is owned by the engineering firm and ported to the GPU. Vendors have to perceive that a market for a GPU version of their software exists, while engineering groups have to determine that it will pay for them to make the investment in hardware, software and expertise.

That concept is a long way from the industry standard Intel and AMD CPUs, which are used to power the majority of workstations (and even high-end supercomputers). Changing that would

be an expensive and time-consuming affair for software vendors.

Nevertheless, the cost and performance of GPUs can make a difference in how design engineering is done. Imagine being able to run an analysis on your design 20 times faster than you can today, for example.

## Benchmarks Are Not Real Life

But it's not a simple matter. First of all, "20 times faster" is highly problematic: Just because some computations can be speeded up by that much doesn't mean that the entire analysis would be. In fact, the overall analysis could even be slower than using a CPU, if the CPU can compute other parts of the analysis faster.

Second, it would be a significant software development effort to run even fairly common code on a GPU. Some types of code may require modification, while other types may not be able to run on the GPU at all. Many engineering software vendors aren't yet convinced that the effort can pay for itself and make a profit.

So it turns out that you still need the traditional CPU after all. You need it because that is where the vast majority of engineering and office software runs, where the primary software development skill set resides, and whose all-around performance is at least good enough to remain in that role for the foreseeable future.

Intel hasn't been sitting still as GPUs have increased performance. Up until the beginning of this year, the company had been working on its own multi-core processor, codenamed Larrabee. While it ultimately canceled the initial release of a Larrabee processor, the technology still exists, and will likely find its way into either an Intel-designed GPU or a hybrid CPU.

Such technology may ultimately provide the best of both worlds: compatible performance on most applications, and high performance on engineering computations.

## A Future with Both Processors

To their credit, NVIDIA and AMD are expanding both the sophistication of their processors and the software development tools for developing, porting, and debugging GPU code. NVIDIA has an intriguing software tool called Nexus that should go a long way toward helping software developers to trace and debug application code from the CPU running on Windows into the GPU, including parallel applications on the GPU, and back to the CPU. These enhancements mean it will be easier to get existing software running on GPUs, although it will still require a software development effort.

No discussion of GPU computing is complete without mention of NVIDIA's Compute Unified Device Architecture (CUDA) parallel computing architecture. CUDA is a key to getting high performance out of certain computations that are important in engineering analysis and simulation.

Many systems using GPUs and CUDA have a single industry-standard processor, usually running Windows or Linux. An application written for a GPU typically has a front end running on one of these operating systems. When a computation is required, the relevant data is passed off to executable code loaded onto the GPUs. When execution is complete, the results are returned to the CPU and displayed.

However, none of the advances and excitement surrounding GPUs mean that industry standard

## GPU Systems Available Today

Commercial GPU-based systems are becoming increasingly common. NVIDIA, in addition to providing processors to third parties, also builds its own systems and clusters under the Tesla brand. These include the Tesla Personal Supercomputer, which has up to 448 cores in a multiprocessor configuration, with up to 6GB of memory per processor, in a deskside configuration for under $10,000. The cluster systems include either straight GPU or GPU-CPU systems in 1U configurations for the data center. A 1U NVIDIA unit with a quad processor configuration can do four teraflops of single precision operations, and about 340 gigaflops of double precision.

In addition, third-party systems are available from engineering system vendors such as Appro, Microway, Supermicro and Tyan. These systems typically provide multiple processors and cores, and deliver high levels of computational power for specific uses.

## A 'Jacket' that Fits

The lack of engineering applications that run on the GPU is a problem that isn't going away soon. Still, there may be an easier way of getting code to run on GPUs.

A startup company called Accelereyes is working to ease the burden for moving code over to GPUs using a product called Jacket. It has started doing so with MATLAB, the special-purpose language from The Math Works used by scientists and engineers.

Here's how it works: Engineers examine their code, and tag data structures that might execute more quickly on a GPU. Jacket takes those tags and automatically compiles those data structures into GPU-executable code. When data and functions use those data structures, it compiles the functions to GPU code, and fetches the data into GPU memory space. When the computation is complete, the data is returned to the CPU space.

Because most engineering groups own their own MATLAB source code, this can be a relatively straightforward approach to using GPUs.

CPU systems are slacking off in running engineering applications. Intel and AMD processors are used in about 80% of the Top 500 supercomputers, and Xeon processors with four cores and three threads per core were released this year.

In addition, if Intel incorporates Larrabee features into future processors, it could minimize the performance advantage of GPUs for engineering applications.

With or without Larrabee, industry-standard CPUs continue to advance. Moreover, the majority of commercial software development targets these processor families.

Because of these caveats, it's unlikely that any engineering team is going to be able to work strictly on GPUs anytime in the foreseeable future. However, that doesn't mean that systems using GPUs can't be useful for more than rendering images on the display. The performance in certain computations involving analysis and simulation can make a difference between one design that is good enough and another that is optimum.

An ideal configuration is one with one or more CPUs and a set of GPUs that use CUDA or similar parallel computation architecture. All support applications, such as email, web browsing, and word processing use the CPU. And with tools such as Accelereyes Jacket (see "A 'Jacket' That Fits,") and NVIDIA Nexus, engineering software will eventually take advantage of both to speed up complex computations. ■

*Contributing Editor **Peter Varhol** covers the HPC and IT beat for DE. His expertise is software development, math systems, and systems management. You can reach him at DE-Editors@deskeng.com.*

FOR MORE INFO:

> Accelereyes
> AMD
> Appro
> Intel
> Microway
> NVIDIA
> Supermicro
> Tyan

# What's Behind Digital Prototyping

> With the help of fast and powerful engineering workstations and clusters, digital prototyping can dramatically shorten product design time.

BY PETER VARHOL


For many years, the new product lifecycle worked in pretty much the same way. Engineers used design software to create schematics for new products. Product engineers created prototypes based on the initial designs, and tested those prototypes according to design requirements and simulated use. Often the initial designs failed one or more requirements, requiring a trip back to the design engineer for modifications. More prototypes would ensue, along with additional testing and analysis, until the design met its requirements. It would then be moved to manufacturing for high-volume production.

Depending on the product complexity and design requirements, this cycle tended to be slow and deliberate. But thanks to high-performance engineering workstations based two Intel® Xeon® processors and innovative design software, design groups are better able to produce and test designs without ever leaving the computer.

The new technique, digital prototyping, lets product stakeholders virtually explore a product before it's built. It lets design engineers produce a product that can be tested, evaluated, and modified before being built.

Digital prototypes can be analyzed and tested in ways not feasible just a few years ago. Product engineers can examine moving parts and estimate fit and wear, and place simulated stress on materials to find physical weaknesses. Industrial engineers can make decisions on form and packaging, and manufacturing engineers on materials and manufacturability. Much of this can be accomplished without actually building out the design. Instead, it's all done on the engineering workstation.

While digital prototyping can't completely replace actual prototypes and live testing, it has

many benefits. A 2006 study from the Aberdeen Group indicates that design groups using digital prototyping build half the number of physical prototypes as the average manufacturer, and get to market 58 days faster than average. That's because fewer physical prototypes being built, requiring less testing.

The result is lower cost and faster time to market with better products. The need for fewer physical prototypes, and the ability to do analysis and testing on the computer, enables product teams to rapidly improve a product within the design lifecycle.

## Driving Digital Prototyping

Digital prototyping isn't happening in a vacuum. It's being driven by the latest generation of engineering workstations that enable design engineers to do far more than simply lay out a concept as a product design. Faster and more powerful engineering design workstations make it possible to simulate the actual product as well as many tests on the product.

Engineering-driven organizations now have access to inexpensive workstations and workgroup clusters based on the new 64-bit Intel® Xeon® processor 5600-series, with six cores and two threads per core. These workstations and workgroup clusters deliver the compute capacity of high-performance computers that were only available in the data center just a few years ago. These systems let engineers create a design, then bring that design to 3D life.

Complementing the best inexpensive workstations are advances in engineering software that is taking advantage of the ability of hardware to deliver higher performance at lower costs. Engineering software vendors such as Autodesk, Dassault, and PTC offer the ability to create digital prototypes from designs. These prototypes can be tested in the software, recreating many physical tests and saving time and money.

For a complex product design, engineering teams can implement an affordable high-performance cluster. These clusters, available from companies such as SGI, Appro and others, take advantage of the Intel Cluster Ready specification to create inexpensive out-of-the-box cluster solutions. Design groups will see new systems with simple deployments using Intel Cluster Ready certified hardware and software components. Intel Cluster Ready simplifies the HPC solution requirements for large and small organizations, making it possible to create even complex digital prototypes.

Design groups are finding digital prototyping to be a key ingredient in breaking the long design, prototype, and test process. ■

FOR MORE INFO:

> Intel Corp.
> Intel/Workstation
> Intel/HPC
> Intel/Cluster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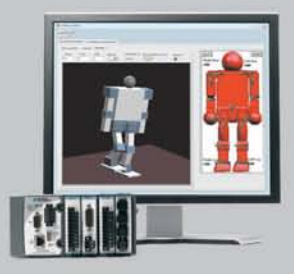

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NATIONAL INSTRUMENTS


# Making the Case for PLM

## Siemens PLM customers explain how they succeed with Teamcenter, and NX.

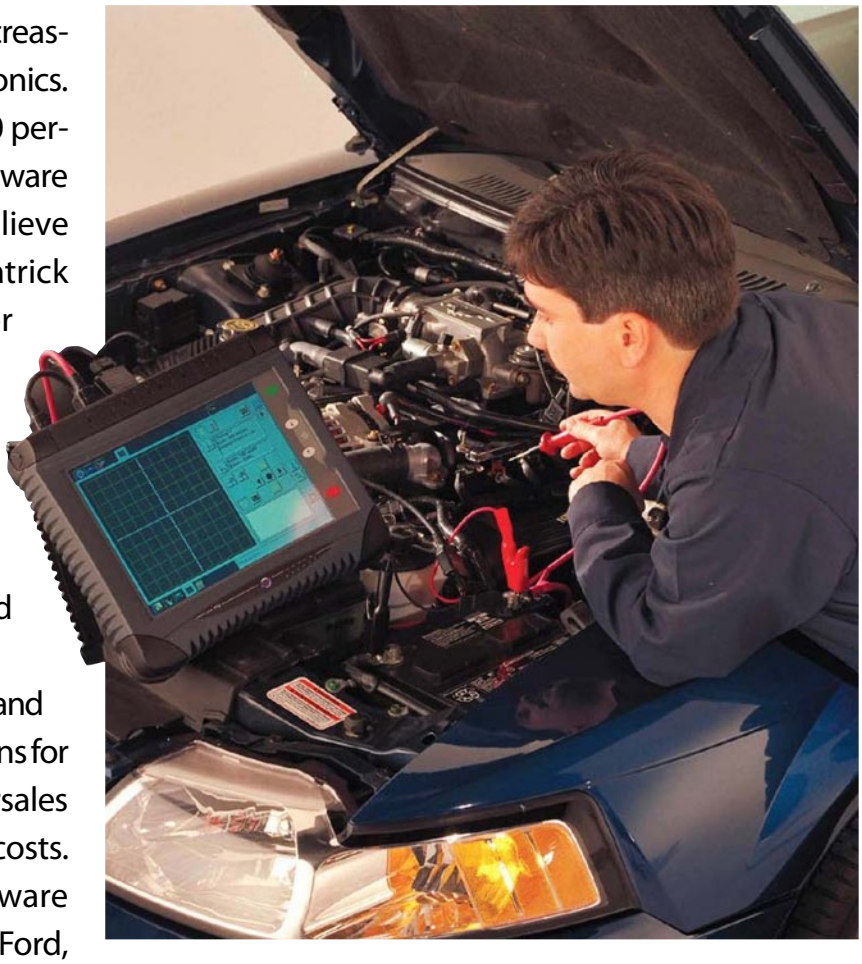
ONE OF THE BEST WAYS TO LEARN about what a new product can do for your company is to see how other companies are using it. While your competitors may be reluctant to throw open their doors and show you how they're using the latest technologies to cut costs and speed innovation, case studies are the next best thing. Case studies explain a problem a company has and how they solved it. Chances are, other companies are having the same problem and can benefit from the same solution. That's why DE always devotes some of its pages to case studies.

This month, Siemens PLM Software has put together a number of case studies for you. Respected companies, such as Ford, Xerox, Seagate, Mercury Marine, ATK and Wright Medical Technology have solved problems, increased efficiencies and fostered collaboration using Siemens software.

### CASE STUDIES

# $100+ million in Warranty Cost Savings for Ford Motor Company

> Using PLM technology to manage in-vehicle software, Ford has greatly reduced repair work and is setting the stage for additional savings through software re-use.



Innovation in the auto industry increasingly involves software and electronics. "The standard estimate is that 60 percent of vehicle innovation is now software and electronics, but we tend to believe it is even higher than that," says Patrick Milligan, Ford's senior manager for vehicle solutions. Ford's Sync feature is a perfect example. This is an optional, in-car communications and entertainment system that gives drivers handsfree, voice-activated control over their mobile phones and digital music players.

The growing prevalence of software and electronics in cars has huge implications for the OEMs.One big one involves aftersales activities and controlling warranty costs. Chris Davey, technical leader, Software and Control Systems Engineering at Ford, illustrates this with a common scenario: "The rapid expansion in the software complexity in our vehicles was creating a problem with our dealerships when it came time to replace or repair electronic control units (ECUs) that had a software glitch," he says. "The traditional ap-

proach was a standard hardware replacement where we would actually remove the ECU from the customer's vehicle and replace it with a new unit. This approach is not a cost-effective solution, but worse is that in the process of removing and replacing an ECU, you might introduce some squeak and rattle type issues into the customer's vehicle which is absolutely not desirable." And with features such as Sync needing to keep up with advances in communications and entertainment technology, it would be cost-prohibitive to replace a piece of hardware on the car each time a software update is needed.

The growing amount of software and electronics also brings with it the need to manage a product with a much shorter lifecycle. "Now we need the ability to manage consumer electronics lifecycles, which turn over in six to nine months, alongside the traditional automotive lifecycle of two to three years," says Davey.

Another implication is that the volume of software needed for each car is growing rapidly. Ford's 2005 models contain between two and three million lines of code. Current 2007/2008 vehicles have an average of six million lines of code. The company is expecting about 10 million lines of code in its vehicles in 2010. In looking at the development costs for all this software (which is mainly written by outside suppliers), the company has made it a priority to increase the amount of code that gets reused.

Integrating and then validating all this software, which comes from all three supplier tiers, is another issue. "While the suppliers do some level of component validation, we have to bring that software together and ensure we've got the compatibility up front and then drive it to completeness," Milligan says. This is complicated by another current trend, the growing interdependency in vehicle electronics systems. "Ten or 15 years ago, you would typically have a power train control module, maybe a transmission control module, and perhaps a brake control module," explains Davey. "Since then, we've seen the rapid introduction of distributed functionality where multiple modules are communicating with each other across a network." A good example is adaptive cruise control, in which brake and throttle control modules must interact. "Today, on some of the high-end vehicles, there are 50 to 70 modules on the network and dependencies involving probably 60 to 70 percent of those modules," Davey adds. When software for one module is updated, the OEM must be able to understand the impact of that change on the other modules.

**"One of the delights of working with the Siemens PLM Software team was their ability to turn around a record amount of development with high quality and on time."**

—***Chris Davey***, *technical leader, Software and Control Systems Engineering, Ford Motor Company*

## New approach to managing software development

These issues required Ford to "come up with a new way of doing business, a new way of testing, validating and managing the software content

that goes on our vehicles," notes Milligan. "This has been a key deliverable affecting future quality as well as the future cost of our products."

Ford is meeting these challenges with the In Vehicle Software (IVS) program based on the Teamcenter® digital lifecycle management solution from Siemens PLM Software. The company already had a large Teamcenter implementation managing its mechanical development efforts, and its satisfaction with Siemens as a partner played a large role in the choice of Teamcenter for the IVS release program. "Another key reason we built IVS on the Teamcenter platform was to ensure a scaleable solution that we can use globally," says Martin Baker, global manager, Software, CAE and Process, Methods and Tools at Ford. Today, Ford brands in North America, Europe, Asia Pacific and Australia are using the IVS system.

**"Another key reason we built IVS on the Teamcenter platform was to ensure a scaleable solution that we can use globally."**

*—**Martin Baker**, global manager, Software, CAE, and Process, Methods and Tools, Ford Motor Company*

Essentially, Ford and Siemens PLM Software applied to software some of the same practices – such as configuration management and options and variants – that make PLM effective at managing mechanical systems.With software, each file is similar to a part in the mechanical world. What PLM does is make it possible to relate that software file to the vehicle usage, model and platform it is used in. IVS also makes it possible to understand important attributes about the software file such as programming protocols, network protocols, memory sizes, disk file sizes, memory address space of hardware and so on. Validation algorithms can report discrepancies between engineering meta-data, software files and their use in service.

Because much of Ford's software development is done by suppliers all over the world, suppliers use Teamcenter to check software files for common problems automatically when they are uploaded. This helps detect bad software files at the source and get them corrected before they are distributed further. Issues such as header information, memory size consumed, format of the binary file, binary file part number, certification document, test cases and configuration file are checked against the set of requirements. The structured lifecycles introduced in Teamcenter ensure that changes (to address field concerns) are audited in the system from early detection of errors to final engineering resolution.

## Tracking software down to the VIN

IVS takes advantage of the Teamcenter systems engineering functionality to solve the problem of communication between ECUs by monitoring and tracking software dependencies. Teamcenter identifies where a particular software component is being used: in which vehicle programs, in which series, in which variants of those programs and in which global locations. The manufacturing data model in IVS tracks information for in-plant flashing, ensuring that correct software assemblies are flashed during manufacturing within the

context of plant, program, variant and ECU type.

This has two major benefits. First, it enables Ford to perform impact studies whenever a software change is made. The other benefit is that Ford can now trace the ECUs to an individual customer's vehicle by the vehicle identification (VIN).

Teamcenter also feeds the download to service centers in North America, which then gets broadcast to all 20,000 service stations. So whenever a change is required, it becomes a lot easier to communicate this change."This is a powerful capability," says Davey. "If a customer's vehicle is returned to the dealership with a specific concern that cannot be resolved at the dealership, the VIN can then be used to retrieve the complete software bill of material for that vehicle using tools from our customer service division."

The ability to trace individual software component items is also increasing the amount of software re-use across the global vehicle product line. "In the past, we would recreate and reestablish the software for each individual brand and each vehicle program," says Davey. "Software re-use is one of the major opportunities we see for the automotive industry.One of the strengths of Teamcenter is how it promotes information re-use. The Teamcenter solution allows us to fully reuse software components without any changes."

## Huge warranty cost savings

The third benefit of the IVS project is the ability to update vehicle electronics by simply reprogramming the software. "Between IVS and the fact that we can now afford to put flash memory on virtually all of our control units, we can now reprogram

## Challenges:

>Minimize warranty costs related to software

>Manage the growing amount of software in vehicles

>Reduce escalating software development costs

## Keys To Success:

> Scaleable, global software management program

> Every software component tracked by vehicle, series and variant

> Ability to monitor software dependencies

> Impact studies that show effects of software changes

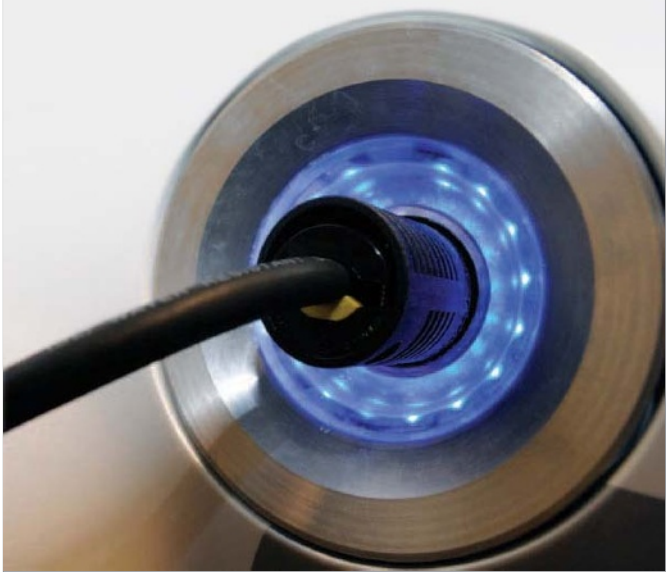
## Results:

>Reprogramming ECUs reduces repair and upgrade costs

>More than $100 million in warranty reduction in three years

>Complete software BOMs for individual vehicles available for dealerships; fewer unnecessary repairs

>Enhanced ability to reuse software components



in the field," says Baker. Since reprogramming a controller is much quicker than a hardware replacement, this reduces the cost of repairs. It also eliminates concerns about a part being out of stock, or the customer having to leave the car overnight, or the introduction of a squeak or rattle during the repair. In North America alone, the flash reprogramming capability has saved Ford a great deal of money in the three years the IVS has been in use. "Warranty reduction was a key driver for us and we initially expected savings of between $1 and $5 million per year. But in three years, we've avoided more than one hundred million dollars worth of module replacements by taking advantage of IVS to reflash modules in the field."

Precise software tracking also reduces the number of unnecessary repairs. Now, when a vehicle comes into the dealership, service can interrogate the vehicle, identify exactly which software is on the vehicle at that time, and use that information to determine whether or not that particular vehicle requires a service. "We can actually target that at the level of an individual vehicle. That has certainly proved useful in filtering out unnecessary repairs that would have taken place under the old system," Baker adds.

Today's innovation trends require that the software development lifecycle is given equal importance to the mechanical lifecycle. This is now the case at Ford. "All the OEMs are dealing with these same challenges and mechatronics is a key issue that the automotive industry must deal with in order to remain competitive," Baker notes. "Tools such as Teamcenter have allowed us to start the merger of the mechanical and the software lifecycles." ■

# "Innovation Delivered" Through Standardized PLM Strategy at ATK

> Teamcenter and NX fuel productivity and mission success.

ATK is a premier aerospace and defense company with more than 18,000 employees in 22 states throughout the United States, Puerto Rico and internationally. ATK develops and manufactures armament, mission and space systems, with the goal to ensure that their customers accomplish their goals – whether they involve a military operation, a satellite launch, or a technological breakthrough.

"At ATK, we're focused on our mission success, on making our customers successful," says David Riemer, vice president, Science and Engineering, ATK Space Systems Group. "We're involved in the Space Shuttle, the Ares Program, the Shuttle Replacement, a lot of technology. We build solid rocket motors as well as participate in other advanced work, including a cancer treatment drug.

"Our business objective is 'Innovation Delivered,' which means meeting our customer commitments. It's understanding the requirements, creating the innovation and putting it in the hands of the war fighter, the astronaut, our customer, whoever that may be, in order to be able to meet their mission requirement."

## "Innovation Delivered" with PLM

To fuel innovation at ATK, the company has fully embraced a PLM strategy that spans the lifecycle, standardized across its divisions and value chain. "The PLM Strategy is important to us because we're creating an environment that can be used in a standard way across the entire corporation," says Alan Whitaker, director of IT, ATK Space Systems Group. "Siemens has helped us focus on what PLM really means to us as a business." Riemer adds, "We picked Siemens' solutions because of two basic factors: One is Siemens' commitment to making sure we're successful. The second is the breadth of the tool set that Siemens offers us."

ATK's PLM strategy starts at the onset of a project. Jon Jarrett, senior manager of Engineering Systems at ATK, explains that this covers "from portfolio management to actually gathering requirements, using those requirements, throughout all the organizations inside of ATK and even our supply chain outside of ATK. And then designing and analyzing the product with Siemens' tools. Obviously one of the most important things is then manufacturing and delivering the product to the customer at the right time for the right price."

Right time and right price means right system. Some companies have preset notions that limit their perspective in making the best PLM choice. Riemer notes, "When most people go to look for tools, they say, 'I'm looking for a CAD data manager. I'm looking for a scheduling system. I'm looking for X.' Whenever you approach it that way, you focus in on a very narrow point system versus looking for an integrated solution that really does transform the business. What we've found in Siemens' products is the means to have all of those elements in one package."

An integrated, enterprise approach ultimately enables effective collaboration. "Siemens provides a footprint that we can take and utilize throughout all of ATK so that we talk a common language, so that we communicate in a succinct way and know what each other is doing, so that manufacturing may be done at a totally different plant than the design engineering effort," says Jarrett. "We're then able to use the common tools that Siemens provides in order to communicate across manufacturing, across quality, across all of the aspects of the product."

At ATK, collaboration typically extends beyond

### Challenges:

> Complex, mission-critical products

> Pressure to deliver on time, under budget

> Many diverse business units

> Balancing innovation with execution

### Keys To Success:

> Standardize PLM across divisions

> Use "Quick Start" approach to implementation

> Leverage full application breadth of PLM

> Engage all lifecycle participants, including customers, suppliers and partners

the organization. Riemer explains, "We collaborate extensively with our NASA customer on Ares and on the shuttle program.We do programs with the Navy and the Air Force, and it's important that we can collaborate with them. We share and act as a team using Teamcenter's community collaboration." Jarrett adds, "We're utilizing Teamcenter to connect our products to our customers, to our suppliers, to our vendors. They are part of the actual work flow process. So they may approve our design changes as well as our designs. In a collaborative role, we're able to utilize Teamcenter to get ideas from all sorts of venues and manage changes within one system.

"For Ares, the benefit of having the single source of data within Teamcenter has really been the fact that we're getting ready to go fly our Aries 1X, the first unmanned flight of Ares this summer. There were a lot of people who said that couldn't be done. We're going to fire our first development motor, a full-scale, five-segment solid rocket motor. It's the world's largest rocket motor. It'll produce 3.6 million pounds of thrust. It's going to burn 1.3 million pounds of propellant and we're going to do that this August, on schedule."

## Unified PLM to meet customer commitments

A long-time Teamcenter customer, ATK is now transitioning to Teamcenter's unified architecture to take advantage of the most tightly integrated PLM available. "Without a unified architecture, you can do effective data sharing and migration between systems, but it's a loose integration," says Riemer. "What unified does is a tight integration; a sharing of one common set of data for all of these tools. For project management, for systems engineering, for our CAD data, for our knowledge capture, so you get all of that integrated in one system, one data base. It's one data entry. The same piece of information shared multiple times.

"Teamcenter unified is going to help us better meet our customer commitments. By integrating the scheduling information, the cost information and the technical information into one entire package available to our engineering staff when they need to do their work, we become acutely predictable. When a customer expects us to do something, we're going to deliver on it." Whitaker adds, "In the past we've had to support all of these as individual standalone applications." With Teamcenter unified, now we're going to be able to manage one common environment."

**"We're utilizing Teamcenter to connect our products to our customers, to our suppliers, to our vendors."**

—***Jon Jarrett***, *senior manager of Engineering Systems, ATK*

## Managing customer needs

When it comes to meeting the needs of customers, ATK takes Teamcenter's integrated solutions to a whole new level. "One of the critical items that we look at is managing a portfolio of products," says Jarrett. "Trying to understand what our customers need; trying to understand where we should focus our business resources as well as our financial resources is very critical to the business.

And so utilizing the portfolio management suite is certainly a key contributor to our success."

Riemer agrees, "It's important to understand, of all the projects every year that we want to start work on – and we in engineering have a long list of projects in the queue – we have to figure out which ones make the best business sense.We use Teamcenter's portfolio management tool to help us make the assessment as to which products, which programs, which customer needs are the priority. In so doing, we are also explicitly tracking customer requirements."

Effective requirements tracking translates to accountability. "The requirements gathering up front really helps out in determining who needs to use those requirements," says Jarrett. "We take those overarching requirements and we delineate them into requirements for engineering, requirements for manufacturing and requirements for quality. So at the downstream level, those guys are aware of what requirements they are designing to or what requirements they are manufacturing to. And then they can validate and verify that they're actually meeting those requirements. With overarching and individual requirements management, the entire value chain has access to the appropriate requirements and they're accountable for them."

**"Siemens has helped us focus on what PLM really means to us as a business."**

—***Alan Whitaker**, director of IT, ATK Space Systems Group*

## Not just innovation, "Innovation Delivered"

In the highly competitive business of innovation, it's not enough to have the best technology. ATK's PLM strategy is also focused on execution. "One of the most important things we do in engineering is manage projects," notes Riemer. "If you look at today's marketplace in aerospace, it's very difficult to get a competitive advantage on the technical side, alone. I have to abide by the same laws of physics that our competitors do. I buy materials from the same suppliers that our competitors do. So when you really get down to it, it's very difficult to get a quantum leap in the technical answer that we give our customer versus a competitor's answer. That doesn't mean we don't strive to optimize such breakthrough insight, and we do use the tools to do accomplish that, but what really is important is impeccable delivery on the total set of customer commitments, which means delivering on schedule, on budget, a technically superior answer."

Jarrett adds, "Technically we're really good, but to manage cost and schedule is a whole different ballgame for us.While we're effective, there's always room for improvement, which can mean a competitive advantage. Therefore, we're focusing on using the project management tool to help us thoroughly understand the schedule that we need to meet. We identify the critical deadlines that we must address as we design the product. Having such information available for everybody to look at and collaborate on throughout the process is extremely important for us in meeting the cost and schedule requirements of the program."

The systems engineering capabilities of Teamcenter stand out in helping ATK meet its goals. "We can go all the way from a customer's set of requirements, their statement of work, to the tasks in a schedule and we can trace all the way back to that statement of work and know why we're doing that task. We're doing that task to comply with this portion of the customer's requirements, the statement of work. There isn't anything like that out there. A company buys a scheduling system for project management, but then it stands alone. Many create their own work scope within Word. Well, we can create that within Teamcenter using Microsoft Office products like Word. We can actually trace all of those customer requirements down to 'why we're doing it.' So when we hand an engineer a job to do, we can hand them defined scope, including: 'Here's the number of hours you have to do it. Here's the time frame you've got to do it. And here's the complete set of technical requirements that are needed in order to do the job.' We do that using Teamcenter's systems engineering functionality."

## Design and simulation for next-generation space shuttle

For product design and analysis, ATK uses Siemens' NX™ digital product development solution. "ATK has been a long time user of the I-deas product and we're now transitioning to NX," says Riemer. "We're using NX on Ares, the replacement to the space shuttle that will take man back to the moon and beyond; perhaps back to Mars someday. We're responsible for the entire first stage within Ares. Therefore, we've got to develop the wiring har-

## Results:

> Reduced PLM deployment time from 2 years to 6-8 weeks

> Deliver on schedule, on budget, a technically superior answer

> Next-generation Ares rocket launch on schedule

> Increased engineering productivity

> Improved requirements accountability and compliance

ness and design plumbing routings of very large structures.We are responsible for simulation and analysis as well, so we are beginning to use the NX tool set to do the modeling and simulation portion of Ares."

"We're using NX for product analysis and simulation to help us really understand how the products are going to operate," says Jarrett. "Our products take care of the astronauts, and there's no doubt that the Siemens' tools provide us with the opportunity to move forward not only with NASA and our contributions to the space shuttle today, but also in proceeding with Ares. To simulate those products upfront is absolutely critical.We have to understand the loads that they're going to be able to take. We have to understand how they're going to perform under flight conditions. And doing the simulation in a digital environment is the only way that's going to be accomplished."

## Off to a quick start to save IT costs

As ATK deploys Teamcenter on the unified architecture across its global sites, the company has developed a fast-track approach to implementation to save time and IT costs. "From an IT perspective, we manage the Teamcenter environment at ATK from our Center of Excellence, which allows us to create economies of scale throughout the entire business," says Whitaker. "The processes we use are standardized, so we're able to increase and optimize the efficiencies that exist in the environment."

Jarrett point out, "The scalability of Teamcenter is astonishing. It's wonderful to be able to manage total project scope across multiple sites and yet have succinct and specific information at the fingertips of the users and the engineers in any location."

ATK notes that the ability to fast track a project is significant in terms of value. "The 'Quick Start Program' is specific to Teamcenter, and enables us to create and implement a production environment for ATK locations as needed," says Whitaker. "This has allowed us to dramatically reduce our implementation costs and the time it takes to move from having nothing to a full-blown production environment. Prior to the Quick Start Program, it might take a couple of years to implement a location with this level of sophistication and return-on-investment to the organization. With Teamcenter, we're able to go out to a location and stand up this environment within six to eight weeks." ■

# PLM Propels Innovation at Mercury Mairine

> Process transformation built on Teamcenter speeds new product introductions

Mercury Marine is the world's leading manufacturer of recreational marine propulsion engines. A $1.5 billion division of Brunswick Corporation, Mercury provides engines, boats, services and parts for recreational, commercial and government marine applications.

Mercury's strategic vision is to be "the most respected and revered global marine industry leader," which requires product development processes that are flexible and fast enough to support constant innovation. And with manufacturing/supplier facilities in 11 countries and engineering activities in six, these processes must operate seamlessly across multiple sites.


## Duplications and delays

"Before the business process transformation, product design data and project data was stored and managed in multiple systems, which led to longer lead times in our product development process," explains Balakrishna Shetty, technical lead for CAD, CAM and PLM Systems at Mercury. "With the defined release processes in Teamcenter to capture the development- and milestone-specific design builds, all stakeholders in the product development process are ensured of using the same information to make the right decisions."

In the past the company also had multiple systems and places where people could take out part numbers. The engineering bill of materials was maintained in spreadsheets by all the stakeholders involved with product development. The engineering change process used multiple systems and it was not automated. "All this resulted in extended lead time in the design and development phase and didn't help the downstream users," says Shetty. CAD data was managed in a PDM environment, preventing the company from leveraging it in cross-functional collaborations.

## Choosing a PLM solution

In the search for a PLM solution, Mercury evaluated software from Parametric Technology Corp. and IBM/Dassault Systems in addition to Teamcenter® software from Siemens PLM Software. Mercury's PLM solution must manage all of the company's product data, including geometric data created by its Pro/ENGINEER® CAD software. It also needs to be able to automate and manage processes such as engineering change as well as support multi-site collaboration.

Mercury chose Teamcenter because it was the "best fit" solution that met these requirements. Another factor in the decision was the willingness of Siemens to work with Mercury to ensure a successful implementation. "A PLM implementation requires a close partnership with the vendor," says Shetty. "Siemens works with us on an ongoing basis to improve the technology mapping of our processes as well as its software."

**"Since implementing Teamcenter, the average time for an engineering change at Mercury has dropped from 56 days to 22."**

—***Lenny Grosh****, project manager, PLM Implementation, Mercury Marina*

## Process improvement before PLM

Prior to implementing Teamcenter, Mercury followed a three-tiered process designed to ensure buy-in at all levels. "When organizations embark upon a major software implementation, they tend to jump straight into the technology without first aligning around cross-functional goals and processes," explains Lenny Grosh, the Mercury project manager in charge of the Teamcenter implementation. "That typically results in either a much longer, more expensive deployment due to mismanaged expectations and misunderstood processes, or an implementation that is deemed unusable by the rank and file, and therefore considered a failure."

Tier 1 involved understanding the top executives' view of the existing processes, capturing the voice of the customer and establishing metrics for success. "This managed the executives' expectations going forward," says Grosh. Tier 2 was a process-definition step in which existing processes were refined at the user level, evaluated and streamlined in preparation for Tier 3. This final tier was the actual aligning of the defined processes to the technology. Once this was completed an extremely rapid implementation was possible thanks to the groundwork done in the tiered approach. "Over the course of five months, we rolled out identical Teamcenter implementations in Wisconsin, Oklahoma (Stillwater and Tulsa), and Mexico; adding a fifth site in China within a year," Grosh notes. Currently more than 800 Mercury employees around the world use Teamcenter.

## Data and processes under control

A key element of the company-wide Teamcenter implementation is the use of a single repository for all product information. This includes Pro/ENGINEER CAD data, design specifications, design standards, material specifications, supplier data and specifications and any other dataset types relevant to the product data. It also includes

**"People in areas such as costing, procurement, quality and manufacturing now have access to design information, even though they don't use Pro/ENGINEER."**

—***Balakrishna Shetty**, technical lead, CAD, CAM and PLM Systems, Mercury Marine*

600,000 items of legacy product data that were migrated into the Teamcenter database.

Mercury's Teamcenter sites are synchronized nightly, allowing a level of global design collaboration. Mercury uses the community collaboration capabilities of Teamcenter for managing project data where teamwork is essential. These capabilities are based on Microsoft SharePoint® server. "With the use of Teamcenter the people in areas such as costing, procurement, quality and manufacturing now have access to design data, even though they don't use Pro/ENGINEER," says Shetty. Mercury uses various workflows and statuses to manage the lifecycle of an item from concept to end of life. As part of the drawing sign-off workflow, Teamcenter pushes the released and approved drawing in a PDF format to Mercury's intranet website for those who need it. Teamcenter is integrated with Mercury's ERP system; the two programs are synchronized daily.

Teamcenter manages project-related information such as documentation, scheduling, team meetings, individual tasks and feedback. Since implementing Teamcenter, Mercury now has just one place where part numbers are created and managed and one place where engineering bills of materials are stored and managed. In addition, a single, automated change management process is now in place, replacing multiple systems.

## Challenges:

> Competitive industry requires fast time to market and ongoing innovation

> Global operation increases collaboration challenges

## Keys To Success:

> Strong PLM vision and executive commitment

> Process transformation rather than simply deploying technology

> Single repository for all product information including Pro/ENGINEER data

> Single engineering BOM

> Identical PLM implementations at five worldwide sites

> All five sites have design changes synchronized daily, participate in single product change management process

> Three different systems were eliminated by deploying a single change management process within Teamcenter

> Daily PLM-ERP synchronization

> One system that manages part numbers throughout the company

> Ability for procurement, manufacturing, quality and costing departments to see latest product information in real time

## Innovation boost

The most telling result of Mercury's process transformation is the way Mercury manages its High Performance Product Development process to-

day. The product development process, along with data management/change management processes, enabled Mercury to introduce more innovative products in short duration using the same or fewer engineers.

This innovation boost is due to a number of factors. "One is design re-use, which is happening to a much greater extent now that Teamcenter searches can quickly identify appropriate parts and designs in the database," says Shetty. With less time wasted creating duplicate parts, there is more time for innovation. Design re-use also reduces costs.

Mercury's accelerated innovation rate is also the result of fewer delays caused by errors. With single source product information and one engineering bill of materials through the entire development process, people now work within one system where they get all the information they need. Also, design modifications are captured through a disciplined and automated approval process.

**"When you see this happening—people seeking you out to ask if you can put a workflow in Teamcenter—you know PLM is a success for the organization."**

— ***Lenny Grosh**, project manager, PLM Implementation, Mercury Marine*

Process automation is another area where time saved goes back to innovation. Mercury's engineering change process offers an excellent example. "Having a single engineering change management process that is managed by Teamcenter throughout Mercury Marine produces significant yearly savings," says Grosh. "Since implementing Teamcenter, the average time for an engineering change at Mercury has dropped from 56 days to 22. These benefits are just the beginning."

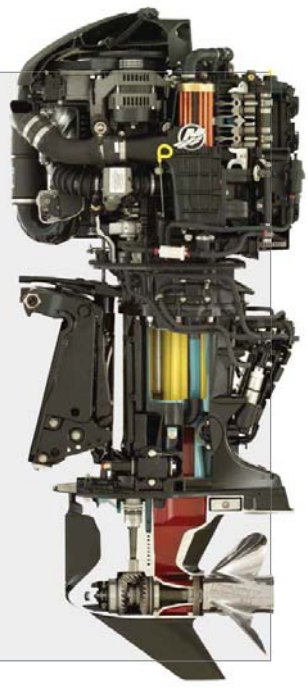
Mercury plans to add additional Teamcenter functionalities because end users continue to find ways to take even more advantage of the software. "When you see this happening—people seeking you out to ask if you can put a workflow in Teamcenter—you know PLM is a success for the organization," says Grosh.

As director of global processes and systems, Bellio believes that Mercury chose an excellent foundation for transformation when it decided to go with Teamcenter. "Innovation is one of our key business drivers," he says. "When we decided to implement PLM, it was with the goal of strengthening our ability to launch new products. As you can see from what we've done in recent years, Teamcenter and our partnership with Siemens have been a great success." ■

## Results:

> Faster product development process due to the established guidelines on storing and managing product and project data

> Increased part re-use by engineers and designers because of one single source for all the product data



# Competitive Product Developement at Xerox Corporation

> New PLM solutions help ensure success in a highly competitive industry


Xerox Corporation is the world's leading document management technology and services company with the industry's broadest product portfolio. Xerox offers digital color and black-and-white printing and publishing systems, digital presses and "book factories," multifunction devices, laser and solid ink network printers, copiers and fax machines.

Xerox sells its products into a mature market where the competition is fierce (competitors include such well known companies as Ricoh, Canon, Konica-Minolta and Hewlett-Packard) and gains in market share are hard won. Like all the players in the high tech and electronics industry, Xerox is also dealing with an increasing number of mandates and regulations aimed at making its products less harmful to the environment.

"These are challenging times," says Korhan Sevenler, the company's director of Product Lifecycle Management (PLM). Sevenler's mission is to make sure that Xerox's product development systems keep pace with the industry's challenges. Part of that, he says, includes a significant reduction in the time and cost of bringing new products to market. "Xerox must continue to deliver innovative, high quality solutions faster then ever," he says. "But at the same time, we need to be spending less on our product development environment. The product development environment must be lean and highly optimized."

## Replacing legacy systems with a unified solution

Underlying Xerox's strategy for a lean and effective product development environment is a unified PLM solution from Siemens PLM Software. Xerox made the decision to standardize its operations in the United States (US) and the United Kingdom (UK) on the Teamcenter® digital lifecycle management solution and the NX™ digital product development system, replacing a mix of proprietary and commercial software. "Over the years, we acquired a number of applications that eventually became part of the Siemens PLM Software portfolio," explains Sevenler. "We purchased them because they were the best tools on the market at the time. But we had other commercial and in-house programs as well.

"When we made the decision to standardize on Teamcenter and NX, it was so that we could have a unified solution for the entire company rather than local toolsets," he continues. "The goal is to have a single source of record for all product information. "When the transition to the Teamcenter/NX solution is complete, Xerox will have more than 1,200 people using these applications in the US and UK.

## Making the business case for PLM

"We see a great deal of value in using an integrated system," says Sevenler. Indeed, before making the decision to standardize on a Siemens PLM Software solution, Xerox studied the potential return on investment and predicted a nearly $5 million reduction in product development costs at its UK facility alone.

These savings come from process improvements such as: a single source of product data (including environmental compliance data) that makes information quickly accessible throughout the enterprise; replacing manual, paper-based processes (engineering change, drawing release, etc.) with automated workflows managed by Teamcenter; and virtual design reviews using the Teamcenter visualization functionality.

**"When we made the decision to standardize on Teamcenter and NX, it was so that we could have a unified solution for the entire company rather than local toolsets."**

—***Korhan Sevenler**, director, Product Lifecycle Management, Xerox Corporation*

These process improvements significantly reduce the amount of non-value-added time spent during product development, helping achieve the lean process Xerox is aiming for. In each activity where time is spent more efficiently, significant savings are evident. Having a single source of product data, for example, saves Xerox nearly $1.5 million per year by allowing people to spend 50 percent less time searching for information than they did previously. Replacing the paperbased change management process with an automated one saves $166,000 in a year simply because people spend less time walking documents from place to place to get sign-offs.

"The introduction of Teamcenter for problem and change management has brought us into the twenty-first century, opening up a one-stop

shop enabling global visual access within our organization of all actions, tasks, problems and metric tracking at the click of a button," says Colin Saggers, configuration and change control manager at the UK facility. "Teamcenter has improved the visibility, speed, reliability and data integrity of everyday business within our R&D environment, considerably reducing the processing time of design changes, and in turn freeing up a considerable number of people hours in retiring the old manual, paperbased processes and several cumbersome bespoke legacy systems."

In addition to hard dollar savings, Xerox sees other benefits from the unified PLM approach. One example is the avoidance of rework caused by lost data or traceability problems. Another is an improved ability to benefit from lessons learned made possible by NX Knowledge Fusion – one of the reasons why Xerox chose NX. The company is planning to use Knowledge Fusion functionality to capture some of the specific design knowledge and lessons learned for future designs. In addition, modeling and simulation is enabling Xerox to get new products to market better, faster and cheaper by helping to eliminate some physical prototypes.

"We are convinced that a unified PLM approach will help us bring better products faster to the market with lower costs," concludes Sevenler. "Our competitive strategy for the future includes an integrated product lifecycle process and system and working closely with Siemens PLM." ■

## Challenges:

> Reduced time to market

> Fierce competition

> Increasing regulations related to environmental compliance

## Keys To Success:

> Long-term PLM strategy

> Perseverance in PLM deployment

> Phased approach

> Single source of product data

> Less non-value-added time spent during product development

## Results:

> Faster time to market without sacrificing quality

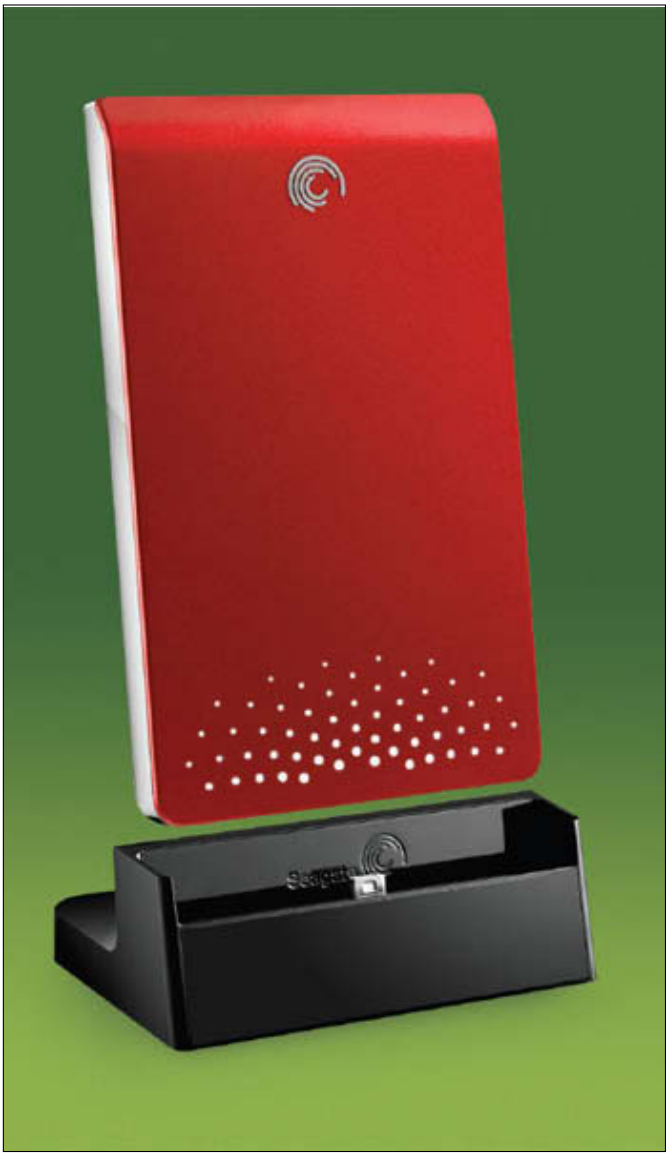
> Resource optimization

> Reduced PLM costs

> Global collaboration

# Using Environmental Compliance as a Competitive Differentiator at Seagate

> Seagate uses Teamcenter to advance green market opportunities.



Seagate is the world's leading manufacturer of hard disk drives. The company has been hugely successful in a competitive market segment by delivering industry-leading innovation and quality while aggressively managing product cost.

The same bold business vision drives the company's strategy for environmental leadership. Rather than a reactive approach to the ever-increasing number of regulations regarding environmentally hazardous content, Seagate has created a proactive product development process that integrates environmental care into the entire product lifecycle.

Based on the Teamcenter® portfolio from Siemens PLM Software, Seagate's environmental compliance strategy goes beyond enabling the company to establish and document compliance with standards such as the Restriction of Use of Hazardous Substances (RoHS) and Waste Electrical and Electronic Equipment (WEEE). Beyond delivering customer and market requirements, the strategy supports Seagate's commitment to corporate environmental stewardship.

"The basic compliance reporting required by the industry is not sufficient for us," explains Brian Martin, senior director, Product Environmental Compliance at Seagate. "From a business perspective, we see environmental care as a competitive differentiator, and we wanted a process to support that vision."

**"One of the benefits of Teamcenter's environmental compliance capabilities is that we did not have to do a lot of customizations. We could just align with its out-of-the-box solution functionality.**

—***Boris Chechelinitsky***, *senior director, Seagate IC*

Cherryl McDougall, executive director of Environmental Health and Safety and Global Citizenship at Seagate, echoes these sentiments: "For us, it's not just about regulatory compliance. It's really about what our customers care about and how we deliver that in the most efficient and effective way. From a product stewardship perspective, we want to make sure that we are delivering the best products with the least impact on people and the environment."

Good environmental stewardship and product knowledge are now differentiating Seagate from its competitors. McDougall explains, "We are able to prove to our partners and customers that we care about people and the environment and we are socially responsible. We are really looking for full disclosure about what's in our product. Some other companies don't take that approach. They'll say, 'We don't have any of the things that are on this list or that list,' but for us, what we say to our customers is, 'Here's everything that we use in our products from start to finish.' We began our strategy several years ago. We made a conscious decision to collect data on every piece, every material that's in our product."

## Challenges:

> New product development

> Regulatory and market requirements to avoid environmentally harmful substances in its products

> Pressures of being in the middle of the supply chain

> Reams of constantly updated substance information from suppliers

## Keys To Success:

> Scalable compliance solution

> Trusted product lifecycle management (PLM) partner

> Ability to leverage compliance data through entire product lifecycle

## Teamcenter supports strategic environmental vision

Seagate chose Teamcenter to address its environmental goals for a number of reasons. One was that it could easily be integrated with other Seagate applications. Also, the software is easy to use and includes a significant amount of environmental compliance functionality out of the

box. "In the evaluation process, we spent considerable time and money making sure the system we chose would satisfy our known customer requirements and support our future strategic efforts as well," Martin says. "Most importantly, Teamcenter supports our strategic environmental care vision and satisfies present and future customer requirements."

Boris Chechelinitsky, senior director at Seagate IC, notes, "One of the benefits of Teamcenter's environmental compliance capabilities is that we did not have to do a lot of customizations. We could just align with its out-of-the-box solution functionality. That reduces our cost, not just in putting the original solution in place, but also in maintaining and going forward. As long as we can rely on Siemens PLM Software's upgrades, we can keep our costs low and we keep it easy for ourselves. That's a big part of our strategy."

Seagate's position in the middle of the supply chain makes environmental compliance especially challenging. The company requires the verification of the content in every component it purchases from its suppliers. But since Seagate is also a supplier to the computer OEMs (as well as markets products to consumers directly), it must also be able to assure its customers of its own compliance with regulations.

For the OEMs, for example, Seagate demonstrates compliance by collecting and producing lab work that proves the makeup of its products. This information can be no older than 12 months. This involves tracking a tremendous amount of data. "We collect current, detailed data on every substance in every material in every part in our product," says Martin. "For each part there can be as few as one or two documents associated with the part or as many as two or three dozen."

McDougall adds, "When you start collecting that data, you're building a database and every time there's a new requirement that comes from the regulations or our customers, we already have the data. It's just a matter of us going to our database and pulling the information out. In contrast, every time our competitors have a new requirement, they need to make adjustments in the types of data that they're collecting. This is an extra burden, an extra cost. But for us, it's really just going to the data and running a report versus collecting new sets of data. We are ahead of the game."

McDougall puts this advantage in perspective: "Seagate has been on the leading edge. We've had other companies ask us about our process and tell us that we are two to three years ahead of them – being able to collect and manage the data efficiently."

## Leveraging compliance data for maximum value, competitive advantage

By managing all of this information in Teamcenter, the company is able to leverage the data in such a way that it has value beyond simply establishing that Seagate's existing products contain no banned substances. Design teams can easily access information to consider compliance during the earliest development stages of new products – for example, to determine how the selection of a particular part might affect the supply chain. Martin has immediate access to the information

he needs to perform strategic analysis and risk management. In addition, sales and logistics personnel can access the information to provide environmental reports for customers and suppliers. Marketing can access the system to look at requirements for various markets.

"Our prior process was very manual and disconnected," says Martin. Previously when Seagate had a reporting request, emails were sent out asking for information and then individuals would assemble the data for the report. It took hours to weeks to produce the data in response to a request. Now with Teamcenter the process is highly automated and can be done in a matter of minutes.

**"Seagate has been on the leading edge. We've had other companies ask us about our process and tell us that we are two to three years ahead of them – being able to collect and manage the data efficiently."**

—***Cherryl McDougall**, executive director, Environmental Health and Safety and Global Citizenship, Seagate*

Martin points out, "Eventually our database will contain information on as many as 20,000 substances. To be proactive in collecting such information ourselves, we needed a solution that could satisfy our reporting capabilities on a global basis. Teamcenter does that. Teamcenter, in fact, makes the process both sustainable and cost-effective, as well as gives us the flexibility to react to future regulations and customer requests."

Ultimately, the Teamcenter solution helps Seagate in its effort to position itself as a green company, which is key to maintaining its leadership role in the highly competitive high tech and electronics market. "Our efforts regarding environmental care represent a competitive differentiator because in this industry compliance with new regulations can mean first to qualify, and first into a major market," says Martin. "Our view is that Teamcenter has played and will increasingly play a critical role in helping us increase our competitive edge." ■

## Results:

> Produced compliance reports in minutes (versus days to weeks previously)

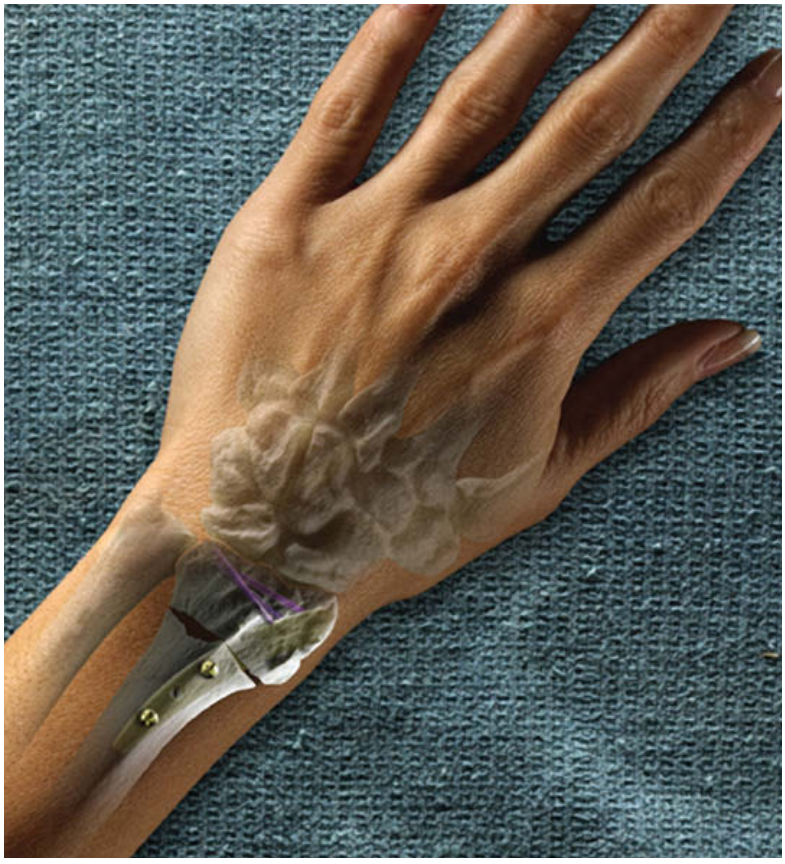
> Established environmental care as a competitive differentiator, while facilitating ability to be first to new markets

> Positioned to easily accommodate future regulations

> Achieved ROI in 6 months instead of estimated 24 months

# Driving Competitive Advantage Through PLM at Wright Medical Technology, Inc.

> NX and Teamcenter help Wright achieve innovation, speed and compliance goals.



Wright Medical Technology, Inc. (Wright) is a global orthopaedic medical device company specializing in the design, manufacture and marketing of reconstructive joint devices and biologics. Wright's product offerings include large joint implants for the hip and knee; extremity implants for the hand, elbow, shoulder, foot and ankle; and both synthetic and tissue-based bone graft substitute materials. Headquartered in Arlington, Tennessee, USA, the company has been in business for more than 50 years, employs approximately 1,000 and is listed on the Nasdaq Global Select Market under the symbol "WMGI."

With a commitment to evolving medical breakthroughs in the field of orthopaedics, Wright management saw an opportunity to think bigger and push the envelope of innovation, quality and compliance by investing in product lifecycle management (PLM) technology – NX™ software and Teamcenter® platform – from Siemens PLM Software.

Wright uses Siemens' solutions for product development, data and medical records management, collaboration, compliance, traceability and reporting, including using the software to meet FDA regulatory requirements.

An example of Wright's applying PLM for innovation purposes is demonstrated in its use of NX. "The

distal radius is the forearm bone on the thumb side and it's the most commonly fractured bone," says Penny Rasmussen, marketing manager for the MICRONAIL® project. "Wright had a goal to make a less invasive, less painful way to repair this common fracture. And that solution was the MICRONAIL® Intramedullary Fixation Implant. NX helped Wright bring that product to the market in record time."

## Visualization, collaboration

According to Chad Schwartz, lead design engineer for the MICRONAIL® project, the assembly package for NX enables Wright to use the implant to design instruments for ease of development and change. "As far as different sizes for implants or something the doctor wants changed, it's easy to do because everything updates succinctly." He notes, "NX is the most powerful design software I've ever used. The solid models, the assemblies, all of the things that come together in the modeling aspect produce better results. You can see things fit together in a way that you can't do in other software. You see your finished product before it's actually a finished product."

Teamcenter extends the company's ability to flourish. "Teamcenter allows Wright to be more competitive in the marketplace by allowing manufacturing, engineering, quality and marketing all to work in parallel with one another," says Schwartz.

**"NX is the most powerful design software I've ever used."**

— ***Chad Schwartz**, lead design engineer MICRONAIL® Project, Wright Medical Technology*

## Challenges:

> Speed and confidence in designing and producing orthopaedic devices

> Compliance with FDA and other applicable requirements

> Ability to continually innovate

> Effective management of product and process data

## Keys To Success:

> NX for digital product development

> Teamcenter for digital data management

> Data access/re-use across decades

> Virtual prototyping

> Collaboration across departments, distributors and customer

"That means saving time, getting our product on the market in a faster manner and beating the competition more often than not. Teamcenter is probably the best thing that's happened to Wright, as far as bringing everything together and making it all one. The time savings alone are worth it. Instead of having to go and find the right design data file in the file cabinet, you have everything right there at your fingertips."

While data re-use is important, collaboration is critical. Schwartz points out, "Before Teamcenter, we had to send the doctor a rapid prototype model. The doctor would send it back to us with markings and tell us how to change it. Now the doctor can look at our model as we rotate it or maybe an animation that we set up in Teamcenter. We get quicker response. Instead of maybe a three-day turnaround, we've got it down to a couple of hours." In addition, he notes, "Our distributors throughout the country can log on and look at what we're designing right then. Show a doctor what's coming. And they can decide right then whether or not they'd like to use it."

As new products are developed and manufactured, Wright has expanded the use of Teamcenter to manage all kinds of engineering specifications in a single platform. This includes gradually achieving the company's objective of an electronic Device Medical Record (DMR).

## Compliance

Complying with FDA regulations represents another important area where an advantage gained can be significant in terms of turnaround, especially as regulations are prone to change often in the medical industry. In fact, Wright has dramatically enhanced the availability of compliance data and reduced the time it takes to access that data. Previously a process that was paperwork intensive – sometimes taking days, weeks or even months – device history is now immediately available. Using Teamcenter, Wright can access the information with a few clicks.

### Results:

> Wright's MICRONAIL® Intramedullary Fixation Implant brought to market in record time

> More efficient design turnaround

> Typical design approval time reduced from days to hours

> Compliance data that once took days, weeks or even months to access now immediately available

## Performance

Wright moved to a product-centric system not just for reasons of innovation, speed and compliance on the front end of the process, but because products need to last the lifecycle of their patients, which can be decades.

The company's approach to orthopaedic medical device delivery – strategically, operationally and technologically – is proving to be quite effective.

Moreover, Wright's financial performance is strong. Rasmussen notes, "We're growing. We're increasing our market share every year. It has a lot to do with the systems that we run, Teamcenter being the main one." ■

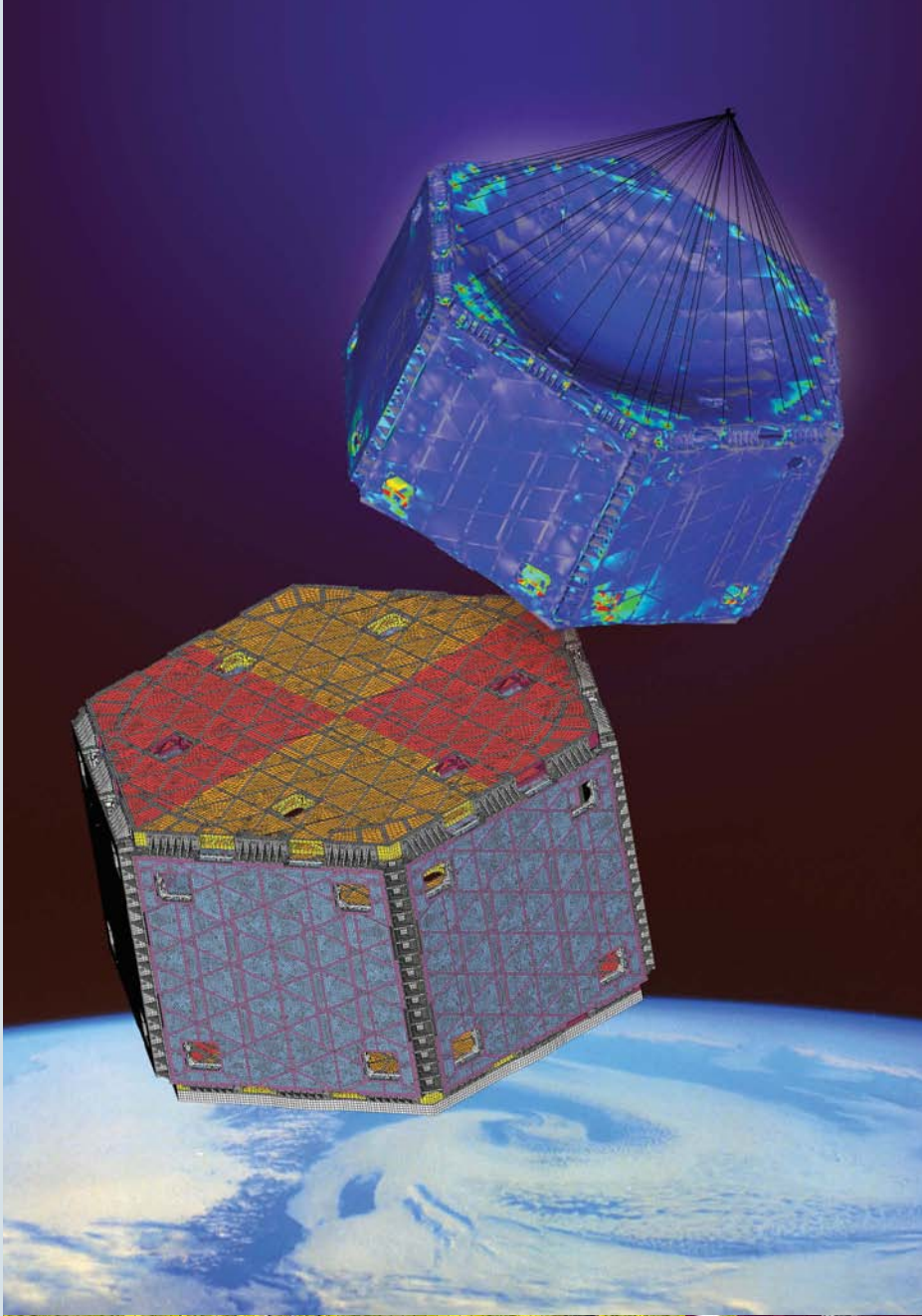
# How can you ensure your simulation software isn't out of date?

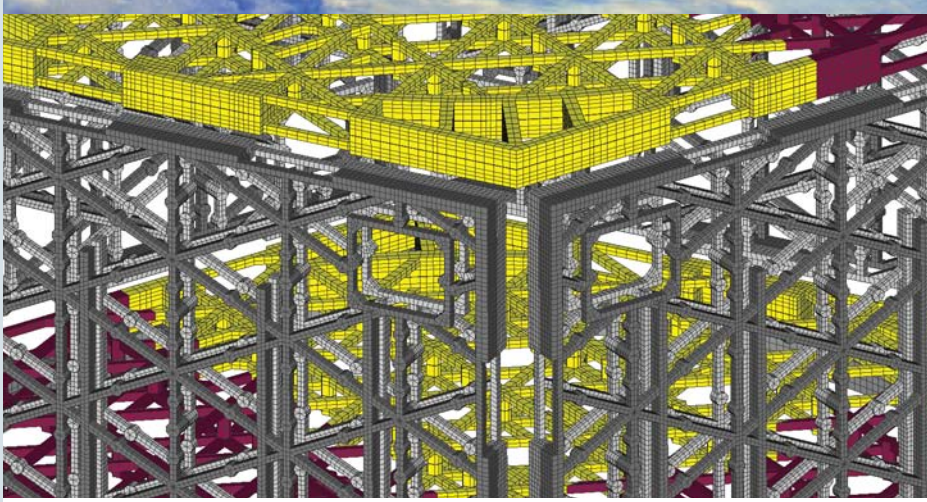
## Femap®

When SpaceWorks (Scottsdale, Arizona) needed advanced analysis to optimize configuration of its new modular "plug-and-play satellite" it turned to Femap from Siemens PLM Software. With Femap, SpaceWorks quickly optimized engineering for multiple configurations of the light-weight, rigid structures and place-ment of batteries, telescopic imagers and other components.

The goal: Create a modular frame-work of panels that use a shared electrical and communications bus that can be quickly assembled into a fully functional and ready-to-launch satellite in a matter of days.

"Creating advanced models that are both accurate and fast definitely gives us a competitive edge and has be-come a critically important contribu-tion on these fast-paced, technically challenging spacecraft projects," said SpaceWorks President Jeff Preble.





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# DE MARKETPLACE

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KNOWLEDGE TO SUCCEED
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# elements of visualization



Photo courtesy of Icona Solutions.

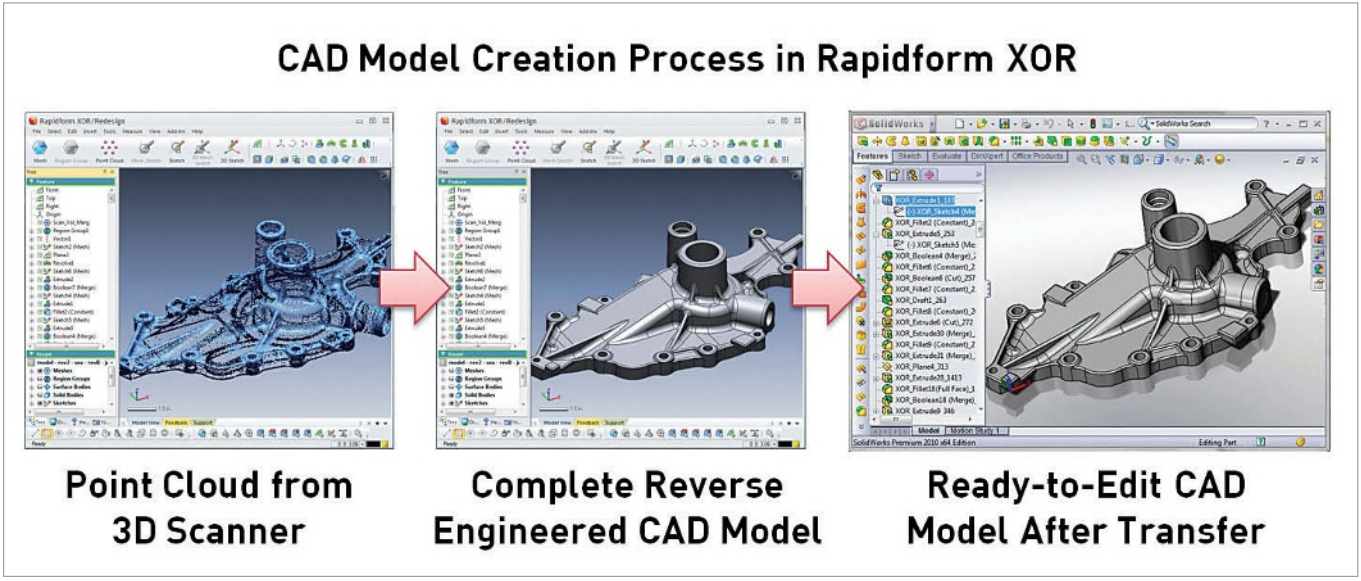
By Pamela J. Waterman

# How to Choose 3D Point-Cloud Processing Software

> Get the most from your scanned data-points with targeted application packages.

Converting scanned data-points into organized, dimensioned—dare we say intelligent—shapes is the job of visualization software packages, each with its own approach to data manipulating, storing, editing and sharing. Point-cloud processing extracts geometric information from files holding millions of points, some or all of which are critical for CAD designers, analysis engineers and inspection teams. Each group has different end needs, so for processing software to offer the best value, it has to be well matched to the task at hand. (See "Where Do You Stand on the User Spectrum?" on the facing page.)

DE did its own scan of this field, identifying movers and shakers with offerings that cover 3D CAD file creation, customized inspection and the spectrum of tasks in between. The differences lie in both the target market and the features offered at a given price point. We'll give you pointers on making a good match.




**There are three stages to using Rapidform XOR3 point-cloud processing software for capturing part geometry and creating a 3D CAD model. In this example, parametric features are transferred directly into a SolidWorks file.** *Image courtesy of Rapidform*

Part I of this article covers three well-known packages from InnovMetrics Software, Geomagic and Rapidform; each run about $20,000. In the October issue, we'll cover eight more value-rich packages that may also be a good fit for your job.

## Big Three Visualization Tools

Virtually every 3D-digitizing hardware system comes with some level of point-cloud processing software. Think RapidWorks surfacing software bundled with a NextEngine scanner, or FARO's proprietary CAM2 measurement and inspection capabilities supporting its Laser ScanArm. But for high-end, standalone processing, users and consultants generally consider the Big Three to be Geomagic Studio and Qualify, InnovMetric Software PolyWorks and Rapidform XOR3.

Each has a reputation for a certain area of strength, yet all now tackle both reverse engineering and accurate inspection in ways that were just ideas even three years ago. (See "What's Driving 3D Digitizing?" DE August 2007.) The power of classical surfacing, with its fine level of detail, is now meeting the speed of rapid surfacing with its ability to quickly produce usable files.

Todd Grimm, a consultant in the additive manufacturing arena who also follows the scanning world, sees a real convergence in the field, particularly in user interfaces.

"You have to dive deep into the software to distinguish among the three," he says.

Until a few years ago, reverse engineering software basically connected scanned data points to create a watertight triangular mesh. Users would manually or automatically fit surfaces to this mesh,

## Where Do You Stand on the User Spectrum?

For a modeler (rather than inspector) using scanning, the first question is: What are you going to do with the scan data? Or, as Rapidform's Marty Chader puts it, "What happens downstream?" Here are his thoughts to help you see the best path.

Is the model likely to be changed? If you are scanning Michelangelo's Pieta, the answer is no, but if it's an engineered part and you want to perform finite element analysis or another analysis, then the mesh model—a verbatim capture of the shape—is the desired result. (Although the question arises: "Are any changes likely to result from your evaluation?")

If the user wants to physically recreate the object verbatim, then either a mesh or a NURBS surface serves as input to the various additive and subtractive manufacturing processes (e.g., a 3D printer and computed numerically controlled, or CNC, machine).

If the intent is to create an editable CAD model, there are two more choices: Do you want to recreate the scanned object along with any flaws (originating from either the scan data or the physical model itself), or do you want to create the idealized model as the original designer had intended?

Once you've defined your goals, you're ready to ask companies how they meet them.

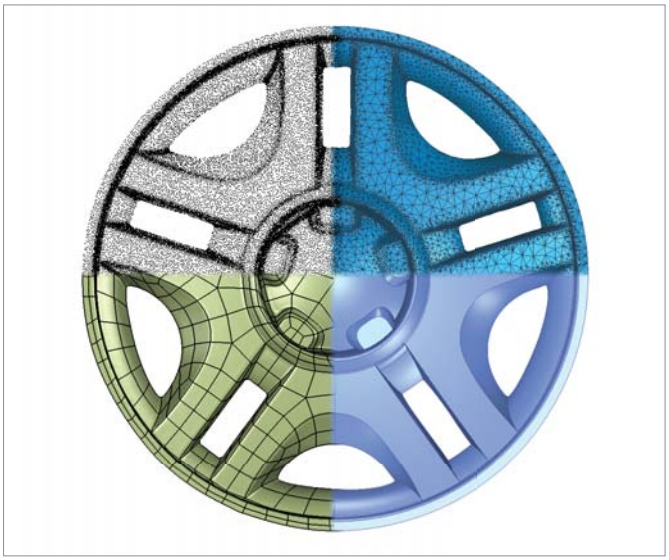
*— PJW*

exporting either an STL faceted file to a 3D printer or an IGES file, or a series of non-uniform rational basis spline (*NURBS*) surfaces to a CAD program. To continue in CAD software, users would take the curves and surfaces as templates for designing a true 3D model with meaningful, editable features.

Marty Chader, Rapidform's vice president of business development, calls this approach second-generation technology because the processing software mostly captured the shape of the scanned item as a "dumb" part with little engineering information. However, since 2007, Rapidform's XOR software (now XOR3) has moved into third-generation performance, offering geometry creation with aspects of true parametric modeling. This approach eliminates the meshing and surfacing steps by modeling solids directly on the points and creating intelligent features. Users can still do 2G mesh and surface fitting, but can also capture such design intents as extrude, revolve, sweep and loft based on 3G design parameter extraction of arcs, lines, etc.

XOR3 software uses a one-step, "live-transfer" process to send the model, feature by feature with automatic assembly, in a native format to standard CAD programs. The process, deemed "the fastest path to CAD," includes more than 20 feature types—along with the modeling history and any designated feature constraints. For users who still work with NURBS, a new automatic surfacing algorithm speeds up generating surfaces from polygon meshes.

However, there are other ways to address both inspection and reverse engineering tasks when dealing with extremely complex details. Innov-



**A composite image created in Geomagic Studio shows the various modes of operation during the steps of point-cloud processing: scanned points, polygon mesh and a choice of working with surfaces or solids.**
*Image courtesy of Geomagic*

Metric Software calls itself "your one-stop 3D metrology partner," and its PolyWorks software fits that bill for both user groups. The package uses a progression of steps that logically splits tasks between the cloud-processing software and the user's CAD package, mindful of what makes for the most efficient approach.

InnovMetric president Marc Soucy cautions users to seek practical capabilities when looking to improve the full process from data capture to CAD model building.

"In the next major PolyWorks release, V12, we will offer a sketcher that produces fully parametric editable 2D sketches," he says, adding that in his opinion, creating a fully editable 3D model within point-processing software is not optimal for two reasons:

**1.** As soon as users get into complex models

involving such CAD operations as Booleans or blends, these functions do not transfer; only simple models do.

**2.** While you could geometrically edit the curve that defines a hole, the associative features found in CAD packages are not created along with it (e.g., automatically applying intelligence to rescale a hole).

Soucy says he believes his product's job is to optimize the geometry on scan data, taking care of tasks that are crucial to his full range of customers. For engineers, PolyWorks generates the quad meshes that *finite element analysis* (FEA) professionals require. For CAD designers, PolyWorks focuses on extracting the freeform elements of a surface for downstream reverse engineering in the user's preferred modeling package. And for inspection teams, PolyWorks' high level of sophistication is well known, offering such advanced functions as tracking part variations with statistical process control.

Sometimes a company's tagline is truly a good clue to what you'll find in its software. Geomagic touts "the magic of making it simple" for both its Geomagic Studio 12 (reverse engineering) and Geomagic Qualify 12 (inspection) packages. In fact, improving the user interface was a major goal for these latest releases, says Studio Product Manager Kevin Scofield, and the main reason behind adopting detail-rich, ribbon-based windows. Customers (split about 50/50 between the

two packages) are discovering "new" functions, he explains, that were actually already in place but not readily found.

For example, to help create a CAD file from scanned data, the previous function "Fashion" is now expanded as "Parametric Surfaces." It examines a part and identifies logical regions such as holes, extrude faces, etc.; interprets areas as planes or cylinders; performs automatic trimming and creates surfaces that a CAD package can recognize. Users can then choose "Parametric Exchange" and send each element to one of five CAD packages (NX, CATIA, SolidWorks, Pro/ENGINEER and AutoCAD), where the regions are connected into parts and dimensions will be assigned. For more organic shapes, AutoSurface performs one-click surfacing.

Partial fill, bridging across a gap, and interactive modes are supported, while the "Mesh Doctor" finds and repairs such anomalies as spikes, in a single click—for Qualify as well as Studio. A downstream bonus is the ability to generate interactive 3D objects in a PDF report for improved team collaboration. One popular end-use is creating scan models of large areas such as factories, bridges and buildings, not often handled by other packages.

## Another Angle to Meshing

In the above discussions, surface smoothness is generally categorized as Class B for NURBS results, with some packages capable of Class A for meshes. There is crossover, however—such as when you maintain curvature continuity while surface modeling, as in Rapidform's XOR-generated surfaces.

Beyond the scope of this article is software defining the fine-finish surfaces necessary for true automotive Class A. Software in this group includes packages from Siemens PLM Software, whose NX 7 software now incorporates the old Imageware capabilities; Autodesk, with its Alias family of surfacing software; and Dassault Systèmes, who some years ago bought the ICEMsurf product line and incorporated its functions into the CATIA Shape Portfolio.

If a CAD model is your goal, ask each vendor in what form the model will export to your software—as well as at what level of complexity and with what solid-model intelligence attached. Ask about training, too: Sophisticated software requires a learning curve, not just wizards (just think how long it takes to discover the capabilities that lie deep in feature-laden Photoshop).

And remember, companies always stress what they can do, not what they can't. Even InnovMetric's Soucy sums up the search process with, "Benchmark, benchmark, benchmark. Do not blindly trust vendors." ■

*Contributing Editor **Pamela Waterman**, DE's simulation expert, is an electrical engineer and freelance technical writer based in Arizona. Contact her at DE-Editors@deskeng.com.*

FOR MORE INFO:

> Autodesk
> Dassault Systèmes
> Geomagic
> InnovMetric Software
> Rapidform
> Siemens PLM Software

By Neil McLeod

# Get the Picture

> Icona Solutions' perceived quality simulation and visualization software promises to cut time and costs for assembled products.

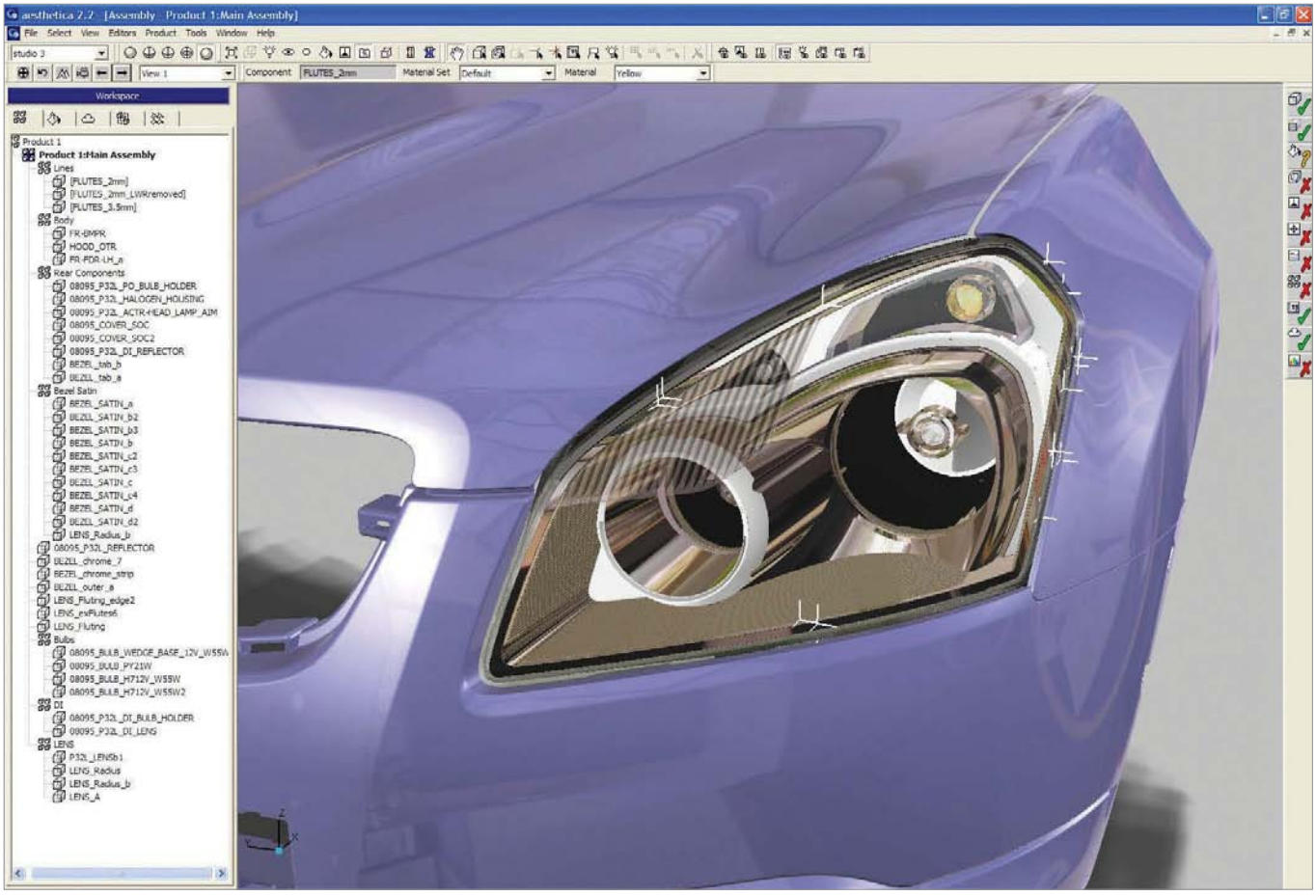
It doesn't matter whether it's a family car, domestic coffee machine, heavy-duty off-road vehicle or a personal electronic device like a cell phone. The perceived quality of assembled products has a strong influence on consumers' buying decisions. Perceived quality—the impression of quality that a potential customer gets about a product when first viewing it, without regard to its functionality—is an essential element of brand management today.

## Pictures, Not Numbers

As its name suggests, Icona Solutions' aesthetica was developed to show designers what a product will look like once the inevitable manufacturing process variation, distortion and deformation take place. It does this not necessarily by replacing traditional tolerance analysis and stack-up tools, but by complementing them with a solution specifically for the process of improving perceived quality—the look and feel, the fit and finish from the consumer's perspective.

Using aesthetica, you apply tolerance, locator scheme and/or manufacturing information directly to the 3D digital product model geometry. The software simulates the resulting variations in component and assembly form and location, including complex deformations such as twisting and buckling. It then presents the results, in real time, in a high-end visualization environment.

An important point here is that you can use aesthetica as early as the concept design stage, when the setting of tolerance targets is key. Perceived quality studies at this early stage can be based on measurement data collected on the shop floor from your existing production processes.



**An aesthetica visualization of key variation target limits on the Nissan Qashqai in a visually sensitive zone: the junction of the headlamp, metal fender, moving hood, plastic grille and plastic bumper.**

Subsequent perceived quality studies continue as the design progresses from concept through the engineering design, validation and pre-production stages. Then they take advantage of more detailed tolerance and locator scheme information as it becomes available.

The output of all variation analyses performed with aesthetica is a 3D visualization of the deformed product model.

## Straightforward Workflow

The starting point for variation analysis and perceived quality studies using aesthetica is the 3D digital product model. This can be imported from a CAD system and styling/surface modeling systems such as Autodesk Alias and ICEM Surf, using IGES or STEP, or directly from CATIA V5 using Icona's CATIA V5 plug-in, or from I-deas and NX using Icona's JT importer.

Once your model data is in aesthetica, the next step is to define the appearance of the various parts using the program's customizable materials and shader libraries. Either manually or by using a predefined template, you simply select the appropriate geometry, by group or individually, then assign a material. You can scale and align this to mimic the production intent. Precise model view-

ing positions can also be pre-programmed, so that you can quickly move between preset audit views during a review meeting.

You can define gap-and-flush measurements using sections placed at key points on key areas along critical split lines between components, and assign maximum and minimum target values to these measurements to specify what would be considered to be limits of visual acceptability. You can even force the design surface to fit any combination of these target values to preview the limits. This will move, re-orient and rescale parts to fit the conditions.

This facility is important for accurately previewing the acceptability of the measurement plan, but it's not yet a full simulation of the expected manufacturing variation. For this, you need to add further information to the model.

The positional constraints of each component and the variation in the parts and features are now defined. A Monte Carlo analysis is then performed to calculate the variation within the assembly and its effect on the measurements.

The end result is a digital model of the assembly that holds all of the information on how your product and its constituent parts will vary during the manufacturing and assembly processes. You can instantly recall and display any of the predicted variation examples that will occur in a production run of, say, 1,000 or 100,000 units. The important

thing is that it shows you the effects of the form variations, including deformation, on the whole product assembly—not just at specified measurement points.

Designers and engineers can collaborate and directly and interactively compare the original design aspirations, in terms of gap-and-flush targets, against an accurate digital recreation of the actual variations that they expect to see in the manufacturing process. Without needing expert knowledge of geometric dimensioning and tolerancing (GD&T), they can see the effects of their decisions—and, together, explore potential problem areas or causes for concern while there's still time to take corrective action.

## What's New?

The latest release of aesthetica, version 3.3, has a number of new features and functions. These include a full 64-bit version and support for multicore/multiprocessor systems, which should add to the product's appeal. Whereas the model size that the 32-bit version can handle is typically limited to less than 3GB, regardless of how much memory is installed in your machine, the new 64-bit version can use all available memory. This allows you to work with much larger and more detailed 3D CAD models.

In addition, Monte Carlo analysis and model deformation is performed up to 25% faster in the 64-bit version, depending on the model size and complexity. The new support for multicore/multiprocessor systems delivers a linear increase in the performance of the simulation, meshing and tessellation processes.

In the visualization arena, new scenario capture functions allow you to capture a series of gap and flush target scenarios (i.e., what is desired from a perceived quality viewpoint) along with actual tolerance scenarios, all combined within a single window. You can then instantly recall them during a perceived quality review meeting.

You can also export these captured scenarios to your favorite high-end visualization solution. In addition to automatically capturing animations of maximum, nominal and minimum tolerance scenarios to AVI movies as before, you can now save them directly into a set of PowerPoint slides, along with the accompanying statistical information.

By enabling those who are primarily concerned with the visual quality of a product to engage those who are involved in the definition and control of manufacturing tolerances in meaningful discussions about a product that is under development, aesthetica improves collaboration and increases design process efficiency. ■

***Neil McLeod*** *is a UK-based marketing and communications consultant who specializes in the design and engineering software applications marketplace. Send feedback to DE-Editors@deskeng.com*

FOR MORE INFO:

> Icona Solutions

By Mike Peery

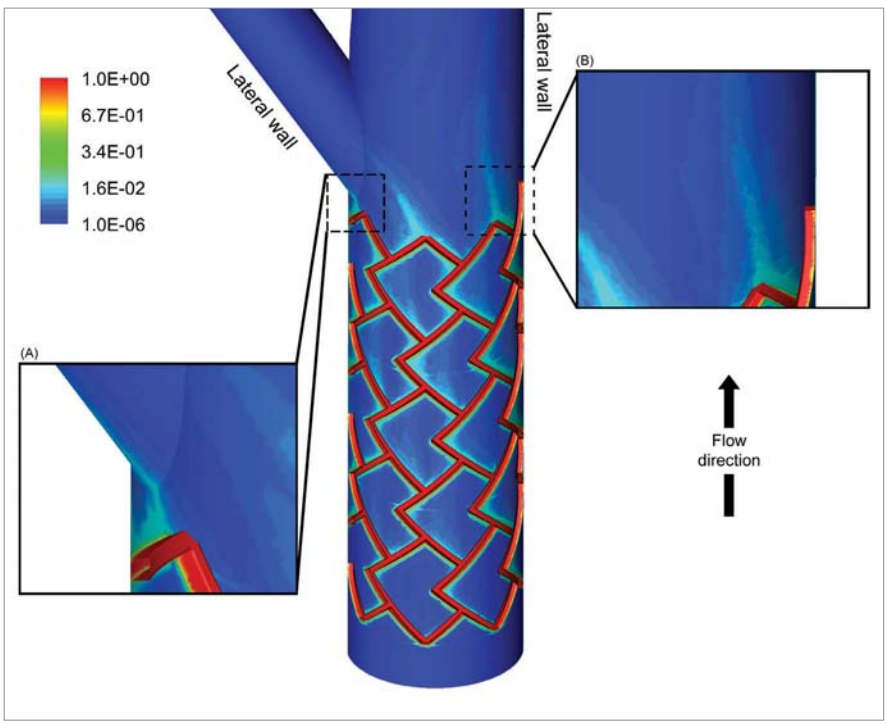
# Modern Stent Gets Medical Makeover

> CFD modeling and visualization software help improve the safety and efficiency of this life-saving device.

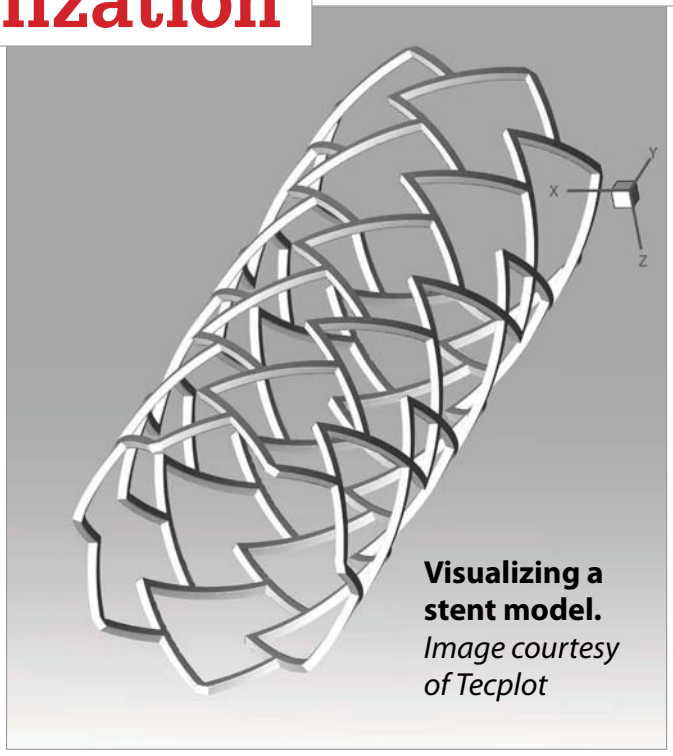
Coronary stent installations were once regarded as miracles of modern medicine. Today, they are viewed as reasonably low-risk, commonplace procedures—with more than 1 million patients receiving stent implants every year in the U.S. alone.

In many cases, stents are lifesavers. But side effects such as post-procedure blood clots and heart attacks are still too common. Research in this area is rigorous and ongoing; however, it is often hampered by the complexities of the human arterial system, the wide array of variables presented in each individual case and the amount of data that must be weighed and analyzed.

This is where computational fluid dynamics (CFD) modeling and visualization methods are being put




**This image shows the surface contour map of drug concentration in a bifurcating artery. A drug is released from the surfaces of the stent, where the red color indicates regions of more drug and blue indicates low drug concentration. The insets show high magnification images of the drug pattern (A) on the lateral wall of the main branch and (B) near the region where the flow divides at the bifurcation. This was created with Tecplot 360, a CFD visualization tool that helps to analyze and understand complex simulation data.**
*Image courtesy of Tecplot*




**Visualizing a stent model.** *Image courtesy of Tecplot*

to good use: They help scientists efficiently manage and analyze data, and ultimately improve the safety of stents. In fact, some very exciting, pioneering work is being done at a number of major universities, including the Massachusetts Institute of Technology (MIT), with CFD modeling and visualization techniques playing a key role in that work.

Dr. Elazer R. Edelman, professor of health sciences and technology at MIT and professor of medicine at Harvard Medical School, is working alongside Dr. Vijaya B. Kolachalama, postdoctoral associate at the Edelman Laboratory at MIT, to revolutionize the world of heart therapy using CFD modeling, bench-top experiments, animal modeling and visualization.

The two researchers are presently trying to get a better understanding of why stents, and the drugs delivered from those stents, can treat arteries on the one hand and cause blood clots on the other. They hope this research will eventually give doctors the ability to predict whether specific arteries with stent implants are at risk of blood clots.

Edelman and Kolachalama also hope their research can help medical device companies develop safer, more effective stents; aid in the regulatory approval process; and ultimately lead to the ability to design customized stents for each patient.

## The Role of the Stent

To understand the importance of this work, it's useful to understand the role that stents play in the treatment of heart patients and the problems they pose. Surgeons typically perform an angioplasty to reopen a blocked artery. They insert a catheter into the patient's artery, and then inflate a balloon at the end of that catheter to compact atherosclerotic plaque against the artery walls. They then insert a stent—a small, metal-mesh tube—to keep the plaque from snapping back into the artery. As part of the healing response, tissue grows over the stent. In 25% to 50% of cases, however, this response is so severe that flow through the artery becomes sufficiently blocked, often requiring another procedure.

To prevent re-blocking, scientists began coating the stents with drugs, frequently embedded in a thin polymer material for time release. Called "drug-eluting" stents, these implants have reduced the need for repeat procedures to less than 10%. But even though the drug-eluting stents prevent tissue and plaque blockage, they create different issues for a small percentage of patients—resulting in life-threatening side effects like blood clots and heart attacks.

This problem lies with the way the metal-mesh stents must sit in the artery where they deliver their drugs. The stent lies against the wall of the

artery, but still protrudes into the artery lumen. The mesh-like structure of the stent creates alternating flow disruptions, similar to the way rocks create whitewater in a flowing stream. The infused drug comes off the mesh struts at high concentrations and, once released, becomes subject to areas of high and low flow. As a result, the drug is distributed and deposited within the artery wall in a non-uniform fashion and, although it is governed by classic flow equations, its flow is non-intuitive and virtually impossible to predict. This issue becomes even more complex to understand when stents are placed at locations such as arterial branch points or tortuous vessels. It is now believed that these heterogeneous drug distribution patterns, with areas of extremely high drug concentration alternating with areas virtually depleted of drug, contribute to the localization of blood clots.

## Addressing Flow Dynamics

While valuable data related to the biologic response to stents and drugs can be obtained through human trials and animal experiments, it's difficult to examine the issues of drug distribution variability from these studies alone. Most current imaging technology is not sophisticated enough to offer a complete view of the drug patterns. In addition, individual patient variability renders it virtually impossible to track the large number of variables at play. Even subtle differences in the geometry of arteries or native disease, amount of drug delivered, change in drug absorption, or the way the stent is implanted can have dramatic effects in drug uptake.

Medical researchers are able to take what they

learn from clinical experience and animal models—as well as bench-top studies—to create physiologically relevant fluid dynamic models. According to Edelman and Kolachalama, this is the ultimate use of CFD modeling and visualization.

## Visualizing the Results

Edelman and Kolachalama are able to gather biometric data from several sources and in many formats to create mathematical models, which can then be solved against multiple variables or parameters. The simulation results, however, are in numerical format, making it nearly impossible for the human brain to interpret.

But by using sophisticated post-processor visualization software, researchers are now able to generate visuals that clearly show how the artery and drugs would behave under different conditions—similar to looking at the visual results from an X-ray or video scope. The resulting images provide insight into how drugs deposited from a stent are affected by numerous factors, including the positioning of the stent, changes in blood flow where arteries meet, and blood flow changes created by the stent itself.

These scientists expect CFD modeling and visualization tools, combined with other technologies like MCAD, will continue to help improve both the safety and effectiveness of stent implants. This can give researchers the means to study stent placement in arteries in a manner not possible before—and that has tremendous implications for engineers as they develop new devices designed to reduce life-threatening complications. Edelman and Kolachalama also hope to use these methods to streamline the regulatory process by giving regulatory bodies the information they need to determine whether proposed changes to stent technology are large enough to require a new clinical trial.

Ultimately, the researchers' work with CFD modeling and visualization will assist physicians in making better "in-the-moment" decisions for patients. With different artery scenarios for each patient, scores of stent types and brands, and short timelines with which to make critical, life-saving assessments and judgments, doctors will be able to quickly sort through mountains of data to select the best stent and placement for a particular patient—based on fact, rather than perception.

These techniques will eventually allow doctors to use computers to compile all the options available, input them along with a patient's medical data into a virtual artery and—like a GPS system that sorts a driver's route—analyze and interpret the universe of variables and optimize the stent intervention. With help of CFD modeling and visualization, the process will become supremely accurate and efficient, resulting in an even better outcome for the patient. ■

***Mike Peery*** *is the co-founder and CEO of Tecplot, Inc. He has more than 30 years of technical and managerial experience in the development of software products for CFD analysis and scientific/engineering data visualization. Contact him via de-editors@deskeng.com.*

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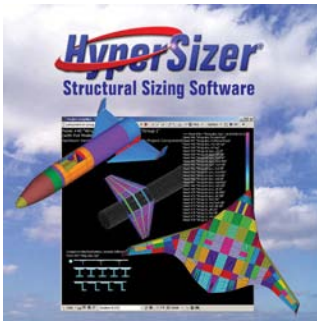


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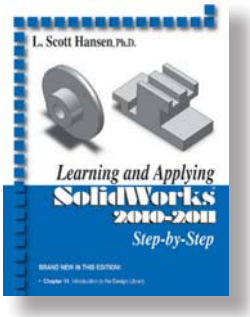


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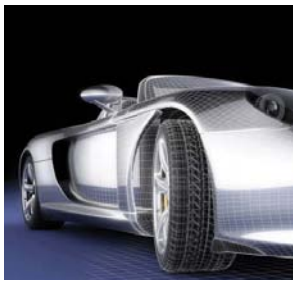

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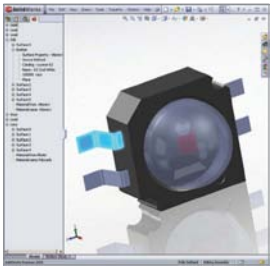
## New Updated TracePro® 7.0 Bridge for SolidWorks®



Lambda Research Corporation announces the release of their updated TracePro® Bridge™ Add-in to SolidWorks 2009 and 2010. The TracePro Bridge enables users to assign, view, save and maintain optical properties across iterations directly in their Solidworks model. These complete opto-mechanical models are easily exported to TracePro ready for optical design, ray tracing and analysis which drastically reduces design iteration time.

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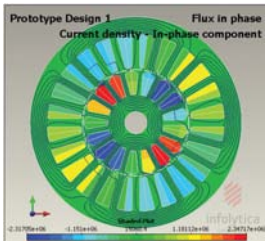


MotorSolve v2 is the design software solution for all types of electric machines. The easy-to-use template based interface makes it effortless to design any number of brushless dc, induction and switched reluctance machines. The integrated automated FEA solver accurately calculates all performance parameters. Request a live demonstration with one of our technical representatives today.

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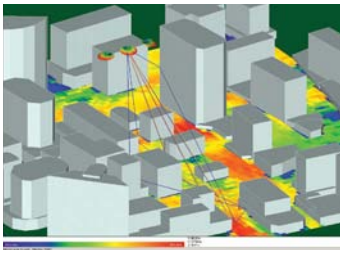

Remcom's Wireless InSite® is site-specific radio propagation software for the analysis and design of wireless communication systems. It provides efficient and accurate predictions of propagation and communication channel characteristics in complex urban, indoor, rural and mixed path environments.

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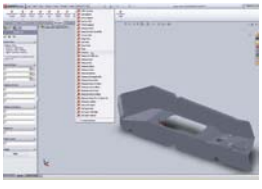


ReSpect™, the Inspection Software Plug-in from ReverseEngineering.com Integrates PCMM Hardware into SolidWorks current and future owners of inspection hardware devices (PCMMs) have long been asking if they can inspect and measure direct in their SolidWorks software. ReSpect, a robust inspection plug-in from ReverseEngineering.com does just that. Save hours and days while performing traditional inspection and measurement tasks. Easy to use and native in SolidWorks.

> ReSpect™

## Rave Computer Introduces Workstations

>**Rave Computer** has released Rave Ignition, a line of engineering workstations that are available in Standard, Premium, and Elite configurations. The Rave Ignition series features the latest Intel technologies and graphics options from NVIDIA and ATI. The systems all incorporate an 85% efficient power supply, with thermally controlled cooling systems.

The Rave Ignition Standard is designed for entry-level 3D CAD and engineering software. This system features Intel's 800-series Core i7 processors delivering quad processor cores, Intel Turbo Boost and HyperThreading. The Rave Ignition Premium runs 900 series Core i7 processors from Intel and supports quad and 6-core processors. They can process up to 12 threads per clock cycle. The Rave Ignition Elite is designed for users running complex multi-threaded applications or who require the ability to do heavy multi-tasking. This system features the new Intel Xeon Processor 5600 Series, and dual server-grade processors with up to 12 cores and 24 processor threads.

## Omega Releases Catalog

>**Omega's** new catalog contains more than 180 pages of the latest information on products for the sanitary food, beverage, pharmaceutical, biomedical and related process markets or lab opera-

## ANSYS Releases Ansoft Designer 6.0


> With Ansoft Designer 6.0's new Solver on Demand technology from **ANSYS**, electronic design engineers can now analyze signal-integrity, power-integrity and electromagnetic interference (EMI) problems from a single schematic- and layout-based environment.

Ansoft Designer 6.0 enables high-speed electronics and RF/microwave designers to access field and circuit simulation tools while designing electronic packages and printed circuit boards (PCBs) — early in the design cycle before manufacturing costs are incurred.

Solver on Demand technology integrates HFSS, 3D electromagnetic field simulation software from ANSYS, and HSPICE, an integrated circuit simulation tool from Synopsys, within the Ansoft Designer 6.0 design platform. The resulting benchmark design flow offers the ability to predict how high-frequency electromagnetic components affect the integrated circuits.

tions, including the Digital RTD Thermometers with NEMA 4 Enclosures for wash down, sanitary, and marine applications. The literature is complete with six sections on Sanitary Temperature Sensors, Sanitary Process Sensors, Control/Displays, Enclosures/Components, Sanitary Laboratory Instruments, and Data Loggers.

## Axiom Announces CadExplorer 4.0

>**Axiom** has released CadExplorer version 4.0. Previously released for MicroStation, CadExplorer now supports AutoCAD DWG files.

With the new CadExplorer, users can find DGN or DWG file objects across multiple files based on a range of search criteria, including text strings, cell or block names, level or layer, color, weight, style and more. It can also make certain batch modifications of DWG objects.

With CadExplorer, users can modify found text strings in a number of ways, including using wildcard and regular expression substitution, and can preview proposed text changes before committing them to all their selected CAD files.

## AMD Releases OpenGL ES 2.0 Driver

>At SIGGRAPH 2010, **AMD** announced the availability of the first software driver for desktop computing environments to support the WebGL industry standard, which is designed to bring

plugin-free 3D graphics to the Internet. The AMD OpenGL ES 2.0 driver is intended to help developers easily create 3D content that can be rendered more quickly for consumers using open-source web browsers, thereby helping create an application-like browser experience.

In addition to enabling 3D and application-like experiences on the web, AMD's new driver empowers software developers to use desktop PCs and workstations powered by AMD graphics, as opposed to embedded systems, when creating applications based on OpenGL ES 2.0 for smartphones, tablets and other portable devices. A common OpenGL ES programming environment makes it easier for developers to port software applications between PCs and handhelds for a seamless computing experience, regardless of device.

Industry association The Khronos Group is developing the open, cross-platform WebGL standard, which is expected to be available this year. According to Khronos, browser vendors Apple (Safari), Google (Chrome), Mozilla (Firefox), and Opera (Opera) are contributors of the WebGL Working Group.

## Quickparts Offers New Somos NeXt Material

>**Quickparts** has announced Somos NeXt, a stereolithography (SLA ) material for rapid prototyping.

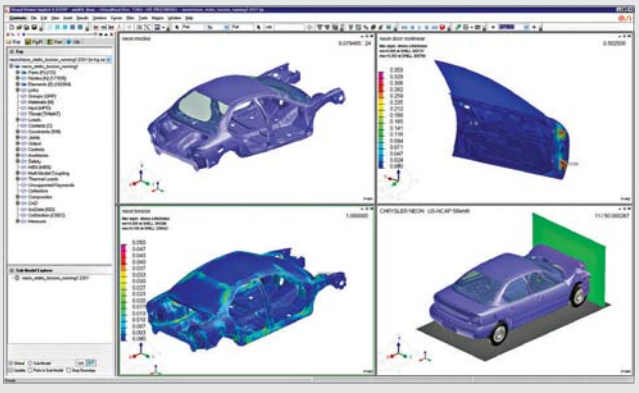
Somos NeXt is an SLA resin technology that the company says produces accurate parts with high feature detail. Based on the existing DMX-SL material, the NeXt resin facilitates the production

## ESI Releases Virtual Performance Solution 2010

> **ESI's** Virtual Performance Solution is scalable simulation software for multi-domain virtual product testing that enables the management of simulation scenarios.

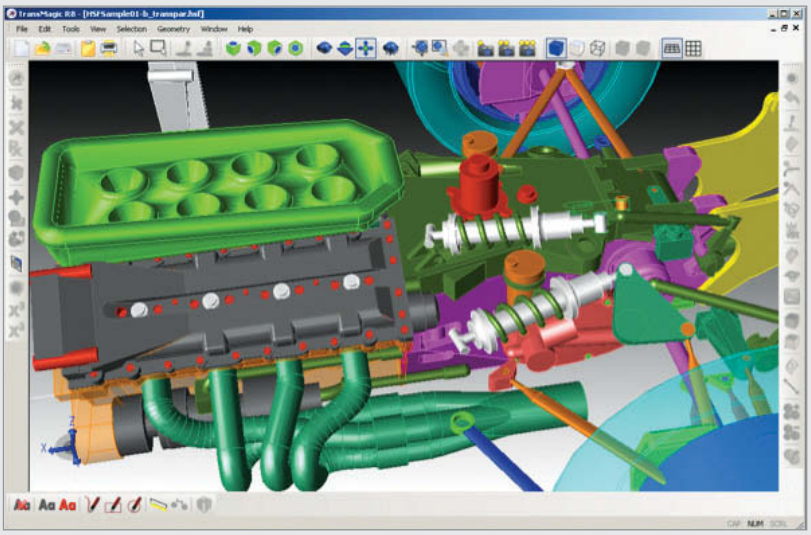
With the 2010 version of Virtual Performance Solution, ESI offers a multi-stage capability enabling multi-domain analysis with a single core model. This enables reduction in complexity vs. the effort of dealing with multiple solvers and workflow processes.

Version 2010 spans crash, impact and occupant safety analysis, motion and dynamics, strength and thermal analysis, as well as noise, vibration



and harshness (NVH) analysis; within a single package. NVH is new in Version 2010, allowing engineers to go beyond crash and safety analysis and solve linear harmonics, transient structural and acoustic problems in parallel.

## TransMagic R8 SP4 CAD Data Exchange Software Released



> **TransMagic** has released TransMagic R8 SP4, which allows users to control CAD interoperability and data conversion processes. This release of EXPERT XL-64 enables a 64-bit computer to process CAD datasets more than 2GB, according to the company.

Along with multi-gigabyte compatibility, the new release offers accelerated graphics technology, upgraded translators, and additional file options and formats. In conjunction with feature enhancements such as an optimized Fast Bounding Box, upgraded Auto Repair Wizard, and large model visualization, R8 SP4 can use the XL-64 technology option.

of complex parts with improved moisture resistance and greater thermal properties.

Parts produced from the Somos NeXt material are much more resistant to breakage than parts made with standard stereolithography resins, according to Quickparts.

## Tracking Additive Manufacturing Revenues

>According to an industry briefing from **Wohlers Associates**, the demand for additive-manufacturing (AM) technology continues to grow, though at a slower rate than previous years.

"The compound annual growth rate (CAGR) of revenues produced by all products and services over this period is 26.4%," according to the report. "The CAGR slowed to 3.3% over the past three years, with 2009 being the slowest in many years, by far."

View the CAGR chart at wohlersassociates.com/growth2010.htm.

The research firm says the 3D printer market segment grew by nearly 18% in unit sales, but lost revenues.

## CADENAS Updates PARTsolutions

>**CADENAS GmbH** will introduce a new function in version 9.02 of PARTsolutions.

With its automatic background search, while users work on their constructions within the software, a geometric similarity search will automatically be started in the background. For the currently opened CAD part, geometrically similar CAD models will be found and listed below the 3D preview. The search is conducted automatically in the background while the user continues to work as usual, according to the company.

## NVIDIA Introduces Quadro-Class GPUs

>**NVIDIA** has introduced the Quadro graphics processing units (GPUs) based on its Fermi architecture, and is also introducing the new NVIDIA 3D Vision Pro solution.

According to NVIDIA, the new Quadro GPUs deliver performance that is up to five times faster for 3D applications and up to eight times faster for computational simulation. Those numbers are based on Ensight sub-tests within Viewperf 11 and Linpack performance comparison between CPU and CPU+GPU with various configurations, according to NVIDIA.

The NVIDIA Quadro Plex 7000 array, and Quadro 6000, Quadro 5000 and Quadro 4000 GPUs feature the new NVIDIA Scalable Geometry Engines and leverage NVIDIA Application Acceleration Engines (AXE). Rated at 1.3 billion triangles per second in raw performance (based on GLperf, run by NVIDIA Performance Lab), the Quadro 6000 enables users to interactively work with models and scenes that are five times more complex.

Watch for a review of NVIDIA's GPUs in an upcoming issue of DE.

## Tech-X Releases VORPAL v4.2 Simulation Software

>**Tech-X Corporation** has announced the release of VORPAL v4.2. VORPAL is a software framework

## IntegrityWare Releases SubD-NURBS Modeling Software

> **IntegrityWare** has released SubD-NURBS, which is designed to unite the modeling paradigms of Sub-D (Sub Division Surface) modeling and CAD (NURBS-based) modeling.

SubD-NURBS converts Sub-D models into a NURBS-based format that can interface with CAD systems or CAD applications.

SubD-NURBS supports a workflow where conceptual designs can be generated using Sub-D modeling operations to demonstrate the design concept. That design can then be modified with Boolean operations, 3D logos, fillets, shelling, or other advanced surface construction tools. The results can be analyzed or sent to rapid prototyping machines. Users can then go back and edit the original Sub-D model and propagate the CAD operations (Booleans, fillets, etc.) onto the modified version of the Sub-D conceptual design to facilitate quick design revisions.

that enables electromagnetic and electrostatic simulations composed of particles and fluids for 1D, 2D, and 3D geometries.

According to the company, new capabilities will allow users to apply VORPAL in new application areas and enable more advanced simulations of the physics being studied. New capabilities include additional collision models, import of user-defined secondary electron yield data, a new photoemission model, and delta-F particles for modeling tokamak geometries.

VORPAL offers a combination of physical models to cover a range of plasma simulation problems that benefit from the parallel algorithms incorporated into the VORPAL framework. ■

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For example, last spring, consumers discovered a children's character doll had a design flaw. The manufacturer quickly issued an apology and offered replacement dolls.

Other times, mistakes can be painfully costly, leading to product recalls. Look no further than the plight of the auto industry: Automaker recalls have prompted response from regulators, including the introduction of the Motor Vehicle Safety Act of 2010.

Given the increasing pressure to get products to market faster, are mistakes like these simply the cost of doing business in the 21st century? With digital prototyping, they don't have to be.

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## Proactive Strategy

Digital prototyping software that is available today offers not just faster time to market, but can also help increase product quality. Digital prototyping forms the foundation for a series of best practices that could increase collaboration, and improve overall product design and development.

For example, motion control technologies company Parker Hannifin uses digital prototyping to share designs with customers, and collaborate with them in a virtual design studio. Bringing its customers into the process—and involving them during all stages of development—can minimize the potential for product errors.

In fields like mechatronics, which brings together mechanics, elec-

tronics, computing and controls into the development of complex engineering systems, digital prototyping helps keep all the different specialty areas apprised of what's happening in the other areas as the product or part moves through the design process.

For example, when a product's aluminum surface is altered by a mechatronic specialists, the amount of on-order aluminum sheet metal in the bill of materials changes instantly. Using a single digital model bridges the information gaps that typically exist among different specialty groups. The result is not only a faster product development lifecycle, but a better product.

These benefits extend to manufacturers of all types. Custom motorcycle helmet manufacturer Troy Lee Designs has reduced design and development time by 35% by deploying digital prototyping, allowing the company to stay ahead of quickly changing consumer tastes. Troy Lee Designs has found that speed doesn't sacrifice quality.

## Marketing Advantage

RKS Guitars of Thousand Oaks, CA, uses digital prototyping to bring new thinking to the 50-year-old world of electric guitars and basses—and was able to design its first line and sell its first products to distributors without having produced a physical guitar.

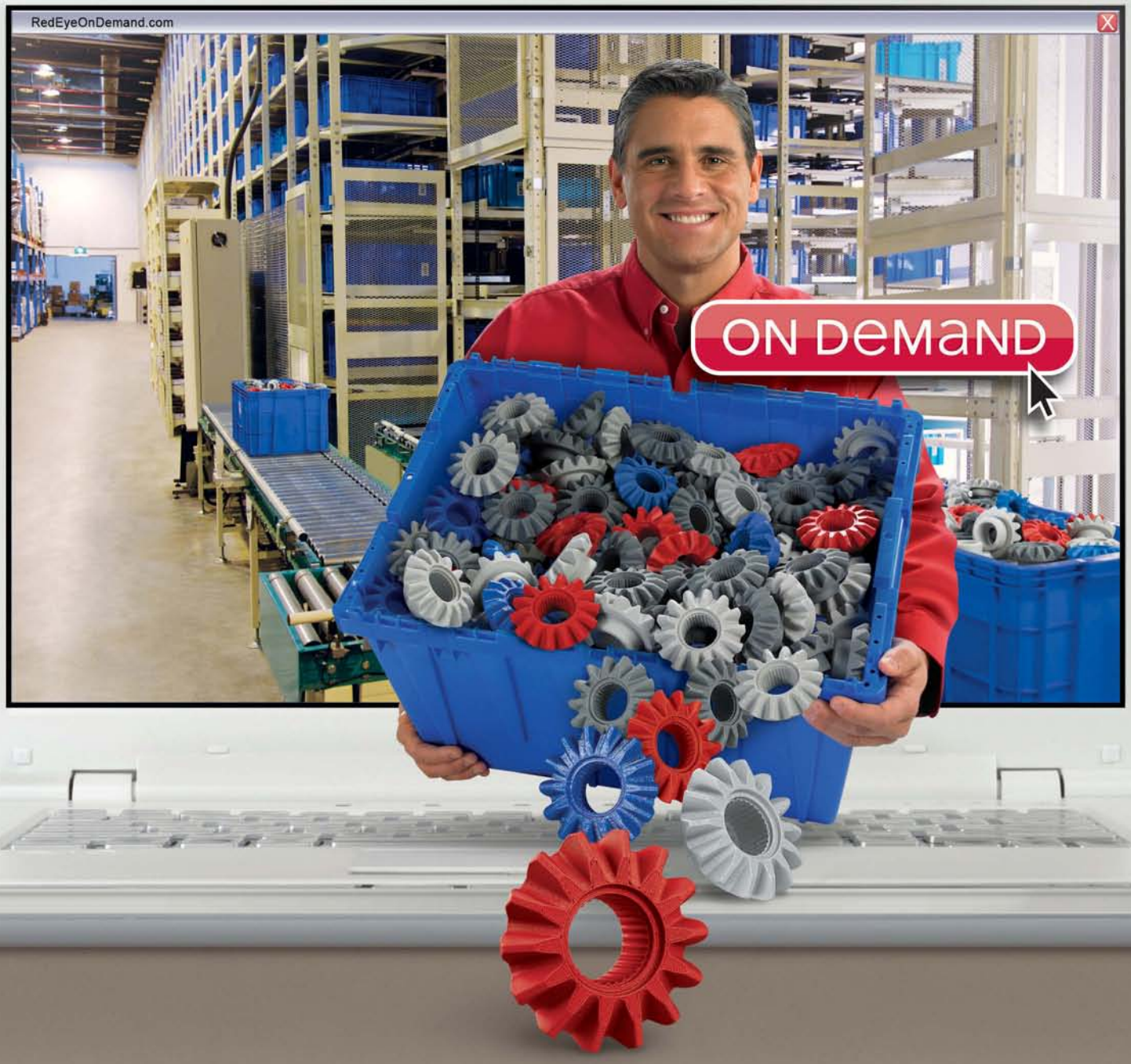
As a partnership between industrial designer Ravi Sawhney and Rock & Roll Hall of Fame musician (and Traffic co-founder) Dave Mason, RKS was founded to create the first open-ended, hollow-body guitars based on human sound-producing anatomy.

To create these guitars, the design team and Mason used digital prototyping to collaborate across continents on the guitars' sculpted surfaces, on physical playing ergonomics, and on musical tone. The marketing department then used 3D virtual brochures to sign up distributors while the first guitars were still being produced.

**Using a single digital model bridges the information gaps that typically exist among different specialty groups. The result is not only a faster product development lifecycle, but a better product.**

Using digital prototypes to design, visualize and simulate the real-world performance of products creates an environment in which designers, engineers and customers can collaborate continuously, from concept to production, helping to get better-designed products to market faster and with fewer errors. As a result, companies needn't worry about choosing speed or quality: With digital prototyping, it is well within their means to help achieve both. ■

***Robert "Buzz" Kross*** *is senior vice president of Autodesk's Manufacturing Solutions Division*

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