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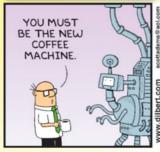






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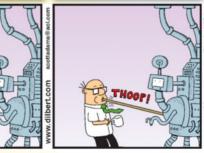












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# Manufacturing is AMP'd Up

nnovation is an overused term. It's tossed about to describe everything from mops to robots. But it's easier said than done, as a recent report to President Obama written by some of the top minds in the country indicates.

The report to the President titled "Ensuring American Leadership in Advanced Manufacturing" was submitted by the President's Council of Advisors on Science and Technology (PCAST) in June. The council includes some impressive names from Harvard, MIT, Yale, Princeton, Microsoft and, perhaps most famously, Google's Executive Chairman Eric Schmidt. Their assessment: "We cannot remain the world's engine of innovation without manufacturing activity," according to the report.

There are many reasons for the loss of U.S. manufacturing leadership and jobs. Lower wages abroad that tempted companies to build factories on foreign shores is often the scapegoat, but the report refutes this as the primary cause, citing gains in the manufacturing sectors of Germany and Japan as the U.S. manufacturing sector fell behind. The real reason? A lack of support for U.S. innovation.

# What can you do to support a local infrastructure that fosters innovation?

One of the council's recommendations was to create an initiative to support advanced manufacturing via researching new technologies, creating public-private partnerships and developing design methodologies and shared technology infrastructures.

#### **Acting on the Proposal**

The President apparently agreed with PCAST's recommendation, because on June 24 he launched the Advanced Manufacturing Partnership (AMP) by announcing more than \$500 million in investments in advanced manufacturing technologies.

"Today, I'm calling for all of us to come together — private sector industry, universities, and the government — to spark a renaissance in American manufacturing and help our manufacturers develop the cutting-edge tools they need to compete with anyone in the world," said President Obama. "With these key investments, we can ensure that the United States remains a nation that 'invents it here and manufactures it here' and creates high-quality, good paying jobs for American workers."

Those "key investments" will indeed be critical if \$500 million is going to have an impact on the \$81 billion trade deficit in advanced technology manufactured products. Most of the investments are earmarked for manufacturing that is important to national security, followed by \$120 million to develop energy-efficient manufacturing processes and \$100 million to discover, develop, manufacture and deploy advanced materials. Next-generation robotics is also on the short list, garnering \$70 million to create robots that will work closely with human operators.

#### **Collaborate to Innovate**

At *DE*, we have reported on the evolving trend of engineers from various backgrounds working more closely with each other, with colleagues from other departments, and with partners from other companies to streamline the design-to-market process. Technologies such as product lifecycle management, social networking, simulation and rapid technologies have allowed the concept-design-analyze-build-market chain to work more efficiently. The parallels between building such innovation on a company-wide scale and a nation-wide scale are obvious.

The AMP plan provides the means to bring together major U.S. manufacturers with high-profile U.S. engineering universities and government agencies to rebuild an efficient chain linking research and manufacturing. Over the last two decades, the focus on nurturing the new information technology economy took too much emphasis away from the industrial manufacturing economy that made the United States the world's leading producer of manufactured goods from 1895 through 2009.

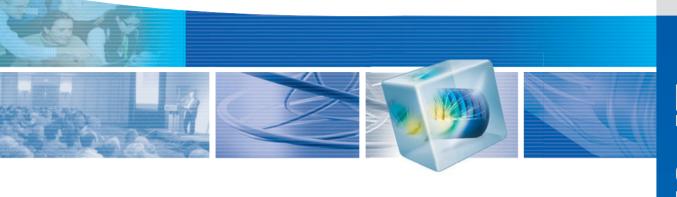
As the "Ensuring American Leadership in Advanced Manufacturing" report puts it: "A strong manufacturing sector that adapts to and develops new technologies is vital to ensure ongoing U.S. leadership in innovation, because of the synergies created by locating production processes and design processes near to each other."

Research and development needs local manufacturing to turn ideas into innovative realities. AMP may not be enough to turn the tide alone, but it's an important first step.

It's also a model that can be adopted on any scale. Like a basic CAD model shared among engineers and tweaked to meet different needs, it can be replicated at state and local levels, modified as needed and deployed. What academic institutions and local government agencies can your company work with to support a local infrastructure of innovation? **DE** 

**Jamie J. Gooch** is the managing editor of DE. Send comments about this subject to de-editors@deskeng.com.





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## August 2011 VOLUME 16/ISSUE 12



#### COVER STORY

## **Metal Mania**

Pamela I. Waterman explains how new options in metal technologies continue to transform the world of manufacturing. From machined aluminum and stainless steel to formed parts crafted in exotic titanium alloys, metalworking in recent decades has drawn upon an increasing range of rapid manufacturing technologies and raw materials. These choices continue to expand, thanks to the ingenuity in worldwide R&D. Check out this issue's cover story for help in sorting through the all the options.



ON THE COVER: Explore the factors that determine the best material and process for rapid metal manufacturing. Images courtesy of POM Group and EOS.

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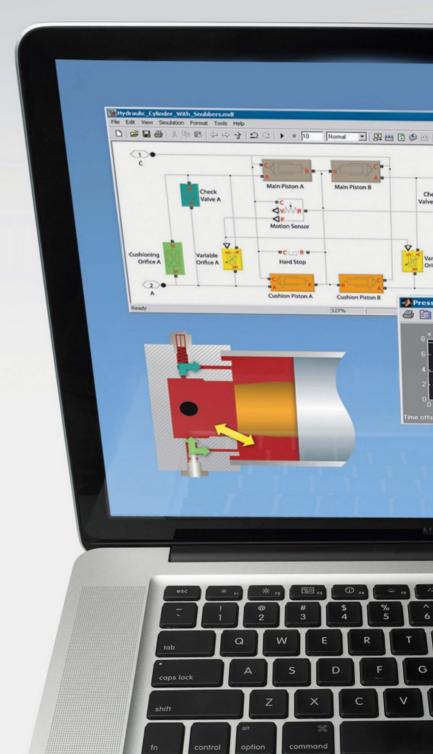
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## The best product designers have an edge.

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Product designers have never been more important to the success of their companies. Creative, efficient designers are the key to delivering better products faster. Too often, however, CAD tools get in the way of their talent—and the company's success.

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## PlanetPTC Live 2011: Embedded Software, Mobile Apps and SocialLinks

n June, when Brian Shepherd was demonstrating a Windchill app for iPad at the PlanetPTC Live conference, he received an enthusiastic round of spontaneous applause from the audience. It happened when he demonstrated that, by shaking the iPad, you could explode an assembly model into parts.

"It's something still in the works," admits Shepherd, PTC's executive VP of product development.

#### Windchill on the Go with iPad

With a mobile app currently in development, PTC joins the product lifecycle management (PLM) vendors who are looking at the emerging mobile devices as a way to jumpstart PLM on the go — a dreamy vision to bring PLM to the nooks and crannies of plant floors, shop floors and manufacturing sites where desktops, laptops, notebooks and even netbooks don't easily fit. For the record, PTC's rivals — Autodesk, Dassault Systèmes and Siemens PLM Software — have also released various apps for mobile devices.

One of the most forward-looking aspects of Windchill — the integration of Windchill SocialLinks - seems tailor-made for mobile devices. With an Instant Messenger-like panel, Windchill SocialLink allows users to upload, download and view activity feeds associated with internal communities.

Windchill 10.0, the latest release of PTC's product data management software suite, has a distinctly browser-like look. (Its primary navigation window is dubbed Windchill Navigator.) But Windchill currently remains, for the most part, a private-cloud or on-premise deployment. PTC has in the past expressed skepticism about cloud computing — the use of a public cloud, like Amazon's EC2 remote servers, to deliver computing ca-



Andrew Wertkin, CTO of MKS (left) and Brian Shepherd, senior VP of product development, PTC (right) discussed the role of embedded software in modern vehicles.

pability over the Web. But its exploration of mobile devices may urge PTC to take a fresh new look at cloud computing.

#### **Embedded Software on the Rise**

The iPad also represents a new trend in current consumer electronics. Its sleek, small form factor would not have been possible without offloading many of its functions to software.

"The world of software is just invading product development," notes Jim Heppelmann, CEO of PTC. "That presents a whole new set of challenges ... Embedded software becomes an enterprise product. It turns out software is also the most serviceable part of the product."

Many industry watchers now acknowledge that software is a major innovation driver in product design. This explains PTC's rationale for its latest acquisition, MKS. Known for MKS Integrity software, MKS caters to manufacturers who need to manage the development, integration and maintenance of embedded software.

"Cars rolling off today's assembly lines include more than 100 million lines of embedded software code, and nearly three-quarters of all medical device innovation is now attributed to software changes," PTC observed in its announcement of the acquisition. "Yet, while software is critical to future product innovation, it is commonly managed independently from the physical product in which it is embedded."

The combination of PTC's PLM and MKS's application lifecycle management could offer an ideal environment for managing the mechanics and geometry of a product and the control software in parallel.

PTC currently has no plans to absorb MKS products into its portfolio, however. MKS Integrity, for example, may remain a standalone product for the foreseeable future (which, in the fastevolving high-tech world, means two to three years). Editor's note: For more on PTC, read last month's cover story "PTC Creo Revealed" by Josh Mings. DE

**Dassault Systèmes V6R2012:** 

In Cloud, in App Store

tealing a few tricks from Apple apps and social media, enterprise software developers are remaking their products to match the behavior of the nomadic herd — always on the go, always connected. Case in point: Dassault Systèmes has publicly released its V6R2012 PLM platform, cloud-ready from the start and complemented with an app store.

From its newly launched 3DStore, Dassault will offer social media-style collaboration solutions. Among the first ones to appear in the catalog are:

- 3DSWYM, a crowdsourcing and community-building platform;
- n!fuze, a collaboration app for Solid Works users; and
- n!volve, a collaboration app for CATIA V6 users.

#### From Private to Public Cloud

Product lifecycle management (PLM) has traditionally been implemented in a secure, firewall-enclosed, clientserver architecture — what some might call "a private cloud." With V6, Dassault customers will have the option to deploy and manage Dassault products — brands like CATIA, SolidWorks, SIMULIA, DELMIA,

ENOVIA. 3DVIA, Exalead and 3DSWYM - on Amazon Web Services. The move pushes PLM from private to public cloud, an area some believe is still vulnerable to security breaches and unexpected failures.

Fabien Fedida, Dassault's senior director for global

marketing, pointed out, "By partnering with Amazon, we get the benefit of Amazon's service level agreement (SLA)." The cloud-service provider explicitly states in its SLA that it "will use commercially reasonable efforts to make Amazon EC2 available with an Annual Uptime Percentage of at least 99.95% during the Service Year."

"Cloud-hosted capabilities in V6 will not be restricted to data management and visualization. They will include 3D authoring," says Fedida.

While it's relatively easy to transmit

and receive small chunks of data for data management in cloud, certain 3D modeling protocols that involve larger volumes of data may test the bandwidth limits of cloudhosted setups.

Cost for PLM apps distributed through Dassault's 3DStore varies, with some as cheap as your typical iPad or iPhone apps. n!Volve, for example, costs \$300 per user per month; n!Fuse



Inventor Publisher Viewer for the iPad, Autodesk's app for delivering interactive 3D files.

\$70 per user per month; additional online storage \$50 per user per month (for 50GB); 3DSwYm \$25 per user per month; 3DVIA Mobile HD for iPad \$4.99; and 3DVIA Mobile for iPhone \$1.99.

Even the costliest of the bunch is priced much less than what a typical CAD or PLM seat costs, but bear in mind, while some apps like 3DVIA Mobile and 3DVIA Mobile HD (for visualizing and interacting with 3D models) can be used by themselves, you'll need a desktop client to take full advantage of others like n!Fuze and n!Volve.

#### A Compatible Touch

Along with cloud-hosted implementation, Dassault is also bolstering some of its brands with multi-touch support. According to the company, "the multitouch experience is applied to 3D design through CATIA direct modeling in Live Shape."

But before you go online to look for an iPad app for CATIA, let me stop you. Dassault's multi-touch support is currently available only for tablet PCs or multi-touch-enabled displays, not on mobile devices yet. DE





## Mercedes Benz, Brought to You by Jeff Patton and NVIDIA

ow long does it take to deliver a Mercedes Benz? In the capable hands of Jeff Patton, a self-taught computer graphics artist, it took about an hour. But that's when he was relying solely on his CPU to produce the digital renderings. Now, by switching to a graphics processing unit (GPU), he has reportedly found a way to churn out a new Mercedes in 10 minutes or less.

In early 2010, Patton's digital artwork caught the attention of Mercedes Benz USA. This landed him an assignment to create images for the carmaker's website and print advertising campaigns. Patton's clients usually provide him with a 3D file in .FBX or .MB (Autodesk Maya) format. He usually exports it to .FBX format for rendering in Autodesk 3ds Max. As 3ds Max data, the vehicle usually weighs around 1.3 to 2.5GB, he estimated. A complete 3D scene comprises roughly 10 million to 15 million polygons.

"Some of the metallic silver paints, dull [paints], or glossy rims [in the images] were the most computationally intense areas for this



An image of a Mercedes Benz, created by CG artist Jeff Patton using NVIDIA GPUs. Patton said, "After I finished my first full Mercedes Benz project with the new NVIDIA setup, I was stunned. Rendering out the images at 6K in the past took me about an hour per image using the CPU. With iray and Quadro, I was able to knock that down to eight minutes - EIGHT minutes!" Images courtesy of Jeff Patton. NVIDIA, and Mercedes Benz USA.

type of project," Patton explains. "I base this on the amount of time the GPUs would take to refine those particular areas in some lighting and environment configurations."

According to NVIDIA, "Since

[Patton] began using iray with NVIDIA Ouadro 6000 and Tesla C2070 GPUs on the Mercedes Benz project, Patton's renders have been running up to 7.5X faster than they had on mental ray and V-Ray running on the Intel Core i7 960 3.2GHz CPU."

Another benefit to offloading rendering to a GPU was, Patton found out, freeing up his CPU for other tasks. "In so many ways, iray running on the NVIDIA GPUs allows me to work faster and create higher quality images," he said. "I'm handling more images in less time, and I can do more things with that time I save — whether it's taking on more work or spending more time with my family."

At a previous GPU Technology



Conference, NVIDIA previewed a cloud-hosted rendering option in development for 3dx Max users (read "Maxed Out on Cloud in iray," Sep 23, 2010, at the *DE* Virtual Desktop blog).

As for the industry's concern about data security within cloud hosting, Patton agrees he's "not 100% sure if my clients would allow me to use such options for security reasons.

"I haven't needed to approach any of my clients to date with this question so far," he continues. "I do believe they would have some legitimate concerns about putting intellectual property out on a cloud system. I'm not sure what kind of security measures will be in place on cloud systems, but that's certainly an area I'll need to investigate further."

Another reason he remains cautious about cloud-hosted rendering is his demands for huge memory: "For example, if the cloud system were based on GPUs with 3GB of memory or less, then I wouldn't be able to use them unless I was able to spend time stripping the scene of any unnecessary parts. Sometimes it's simply not possible to remove enough non-critical geometry or textures for scenes to fit within a 3GB or smaller footprint, such as fly-by animations or 360° rotations."

NVIDIA and other GPU makers have consistently hailed the greater number of cores available in the GPU as one of the reasons artists like Patton are able to render digital images dramatically faster. But Patton admits, "I was not able to test any newer CPUs or dual CPU systems against the GPUs."

As countermeasure, CPU makers like Intel are now developing chipsets that incorporate graphics processors as well as general processors on the same die, hoping to offer performance boost that rivals or supersedes GPU capacity. **DE** 

# The Great iPad Race: DWG on the Go

ow would you like your DWG? For here or to go? If you want it to go, to view it on your iPad or iPhone instead of your immovable desktop, IMSI/Design's TurboViewer may be one of the apps you can use. Released in June, TurboViewer is described as "a free application and the first and only native DWG viewer that supports both 2D and 3D CAD DWG files for the iOS platform."

Folks at Autodesk, of course, will probably dispute IMSI/
Design's claim to be "the first," as it also has its own AutoCAD WS Mobile, a free DWG viewing and markup app for iPad, iPhone and Android devices. That's where semantics — the study of meanings — gets interesting. IMSI/Design may be on solid ground for saying the first to support "both 2D and 3D CAD DWG," because AutoCAD WS is currently limited to handling 2D DWG drawings only. (For 3D DWG files, Autodesk would recommend its Inventor Publisher Mobile app.)

TurboViewer is strictly for viewing, without markup. It gives you the ability to pan, zoom and rotate models using your fingertips on the iPad. If you publish your DWG with predefined views, the recipient of your file can view them via a list of available views.

By contrast, AutoCAD WS offers markup functions in addition to viewing. (AutoCAD WS also requires a login and password to use.) You may, for example, use your fingertips to draw polyline and line segments. Or you may draw a rectangle to single out a region and add notations. AutoCAD WS also lets you take measurements using your fingertips. Like most mobile apps, the software is



IMSI/Design's TurboViewer, a DWG viewer for 2D and 3D drawings.

not meant for precision drawings and detailed works, but it works well for quick approval, review and feedback on design revisions.

But IMSI/Design may have bigger plans for its TurboViewer. The app is, according to Bob Mayer, IMSI/Design's CEO, "The first of many new apps — specifically for DWG CAD professionals — that will make mobile devices as indispensable as a PC."

IMSI/Design and Autodesk aren't the only two design software makers looking at the iPad as the gateway to mobile CAD, however. Recent iPad apps for engineers and designers range from basic analysis (NEi Stratus) to product lifecycle management (Siemens PLM Software's Teamcenter Mobility and PTC's upcoming mobile app for Windchill). **DE** 

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 email him via de-editors@deskeng.com.

## **Fast Apps**



#### **Engineering Case Studies**

#### **3D Mouse Makes Music**

A digital modeling technology company relies on 3Dconnexion 3D mice to design music creation products for musicians around the world.

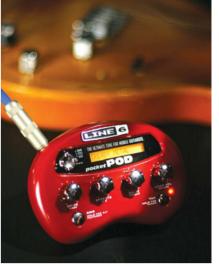
When it comes to developing gear for the studio and stage, Calabasas, CA-based Line guitars and amplifiers, to effects, effects 6 has today's musicians covered. It offers



an array of music creation products — from processors and recording interfaces. Known for its studio- and stage-standard gear, Line 6 invented digital guitar amp modeling technology in 1996, and is currently considered to be a top developer of guitar amps, used by pros and hobbyists alike.

An incredible amount of innovation and design goes into making the tools on which musicians rely. Line 6's lead industrial designer, Dale Wagler, and the rest of the engineering team spend an average of five to six hours a day working in SolidWorks, each using a 3Dconnexion 3D mouse to design and test their products.

"When you're working in a complex



application for hours on end each day, working as efficiently as possible has a tremendous impact on the design process," says Wagler, adding that his 3Dconnexion 3D mouse just makes everything quicker.

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### **Speedy Delivery**

CAD / CAM Services aids Tinker AFB with a modernized engineering data repository.

The Engineering Data Branch at Oklahoma's Tinker Air Force Base (AFB) operates and manages a U.S. Air Force (USAF)-designated Category V Engineering Data Support Center (EDSC) that provides an official Department of Defense (DoD) repository for weapon systems engineering data/drawings. Digital data is stored in the Joint Engineering Data Management Information and Control System (JEDMICS). The branch employs approximately 35 personnel for the acquisition, management, storage and distribution of engineering drawings.

The time required for the engineering data repository to provide a needed stablebased engineering data drawing (known as Mylars) to a customer could be as much as 7 to 15 days. In urgent situations, this created unacceptable delays in the customer processes required for the essential mainte- AFB researched several possible solunance of affected weapon systems.

In today's military and business environment, success depends upon the quality

and accessibility of information and the speed in which the information can be disseminated. To facilitate the speed of information dissemination, the DoD and USAF policy and directions regarding engineering data include a move toward a completely digital environment.

As in previous initiatives to digitize legacy drawings and aperture cards, the OC-ALC EDSC needed to also digitize undimensioned drawings on stable-based material (Mylars) to preserve and fully utilize the government's investment. The overall goal was to fully integrate legacy Mylars into the automated work environment through digitization and subsequent storage in the JEDMICS.

#### **Possible Solutions**

The Engineering Data Branch at Tinker tions for digitizing and integrating the legacy Mylars into the automated work environment, including:



- purchasing equipment for in-house digitization:
- contracting with a drawing conversion service; and
- doing nothing and maintaining the status quo.

Various types of equipment and equipment scenarios were considered as part of an in-house solution. It was determined that this option would be high-risk, because purchasing the equipment capable of providing the required digitizing accuracy would be expensive and costly to maintain.

Maintaining the status quo was also considered a high-risk option because of the potential for loss due to damage, destruction and fading of the existing Mylars.

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#### From Art to Part

Concepts NREC software blows holes in conventional fan design.

New ideas are the lifeblood of Dyson Ltd. Each year, the company reinvests a large amount of its profits into new idea generation at Dyson's Research, Design and Development (RDD) Centre in Wiltshire, England. Located on the edge of Malmesbury, the RDD Centre is home to about 350 engineers - all thinking, testing, breaking and questioning.

The result is a series of everyday products that have been redesigned from the ground up to offer improved performance: the bagless vacuum cleaner, hand dryers using Airblade technology, and now, the bladeless fan.

If a bladeless fan sounds counter-intuitive. it is. But that's Dyson. This is no ordinary engineering company; rather, it's one that offers a proactive attitude to design, think-

ing outside conventional frameworks, and demonstrating a willingness to invest in the latest technologies that can help the company reach its goals in the most effective and efficient manner.

#### **Air Multiplier Technology**

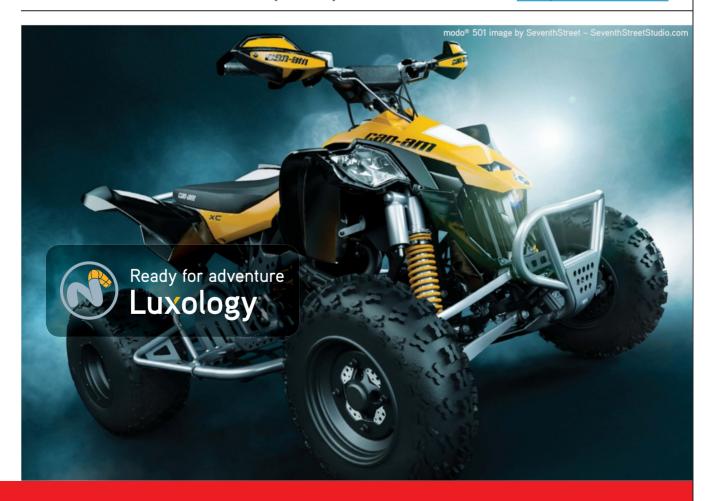
Electric fans haven't really changed since they were invented in 1882. Different materials, new buttons, and the addition of grilles, but still the same problem: The blades chop the air before it hits you. That's why they cause unpleasant buffeting. Take the blades out, and the buffeting stops. But how can a fan work without blades?

Dyson engineers started with pressurized air, forcing it through narrow apertures to create jets. But they needed it to be more

powerful to work in a fan. The breakthrough came when they noticed that accelerating air over a ramp amplified it by up to 20 times, drawing in surrounding air through processes known as inducement and entertainment.

That was the concept; now for the design. Today's design process has to be far more efficient than that of yesteryear. When a young James Dyson became frustrated with his rapidly clogging conventional vacuum cleaner in 1979, he resolved to come up with a better design.

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# Metal Mania in the Rapid Tech World

When plastics just won't do, explore more hefty manufacturing options.

BY PAMELA J. WATERMAN

s quickly as cars morph into robots in this summer's *Transformer 3* movie, new options in rapid metal technology continue to transform the world of manufacturing.

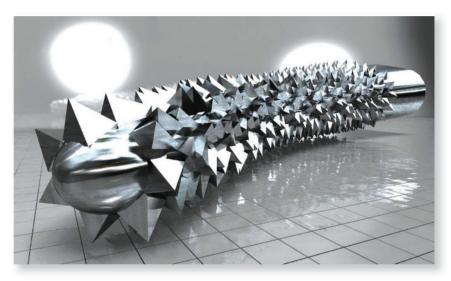
When a part's end-use requirements call for metal, many factors determine the best material and process. High strength, excellent thermal conductivity, machinability/ weldability, corrosion resistance and the ability to create extremely smooth surfaces may all be on the list. Beyond that, design complexity, a need for customization, and control of such properties as material density may point directly to using one of today's "rapid" technologies. Add in the cost of materials, equipment, training and operations, and designers can face a complex array of options — but with potentially stunning results.

From machined aluminum and stainless steel to formed parts crafted in exotic titanium alloys, metalworking in recent decades has drawn upon an increasing range of rapid manufacturing technologies and raw materials. These choices continue to expand, thanks to the ingenuity in worldwide R&D.

*DE* helps you sort through the possibilities, from build materials and systems to service bureaus and valueadded processing.

#### **Direct Metal Manufacturing**

A Big Three group dominates the industry of creating parts directly in metal: 3D Systems, Arcam and



A bone rasp under development by Within Technologies for manufacture on an EOS laser-sintering system. The part represents a particular challenge for AM building, because the surface is covered with 2x2mm pyramids whose orientation keeps changing to match the overall shape of a helix. Image courtesy EOS and Within Technologies.

EOS. Not surprisingly, 3D Systems, the 25-year-old pioneer of additive manufacturing (AM), plays a strong role with its Selective Laser Melting (SLM) systems. (See "Additive Manufacturing 101," *DE* November 2010, for additional AM acronym definitions.)

However, Arcam and EOS, with their Swedish and German headquarters, respectively, have enjoyed the advantage of European medical regulations that historically permit much broader use of AM parts than Food and Drug Administration (FDA) regulations in the United States. That acceptance has boosted medical and dental applications to form the largest segment of direct metal production parts.

Sinterstation Pro DM125 and DM250 SLM systems (differentiated mainly by their build volumes), both from 3D Systems, produce fully dense end-use parts by lasermelting a powdered version of steel, aluminum or titanium alloys. System specifications list excellent surface finish, feature detail and tolerances as attributes of final parts that make them suitable for a wide range of use.

3D Systems' SLM applications



This Direct Metal Deposition rebuilt turbine blade squealer-tip was done on a POM Group system. Sizes vary from 50mm to 600mm (H). *Image courtesy POM Group.* 

include lightweight aerospace and motorsports parts, custom medical implants, efficient heat sinks, dental caps and crowns, and injection-mold inserts with conformal cooling channels. The last example highlights one of the distinct capabilities of additive manufacturing: achieving internal geometry in a single piece that, if traditionally machined, would otherwise require an assembly of multiple parts.

Arcam, founded in 1997, employs Electron Beam Melting (EBM) technology to create parts from powdered metals, primarily titanium Ti6Al4V (Grade 5). This biocompatible alloy has served as the foundation of the company's extensive market in orthopedic implants. The Arcam A1 system is designed to produce custom and standard medical implants in both titanium and cobalt chrome alloys, while the Arcam A2 is optimized for producing large, complex metal parts for the aerospace and defense industries.

Since 2007, Arcam's European customers have used EBM technology to produce and implant more

than 10,000 CE-certified advanced orthopedic implants. Until recently, any such parts produced by U.S. customers were limited to patient-specific implants. However, in February 2011, Arcam announced a significant marketing development: U.S. manufacturers have received FDA clearance to broadly market Arcam EBM products in the states. Arcam says that the U.S. market represents about half of the worldwide implant market.

Metal parts made on EOS' direct-metal laser sintering (DMLS) systems run the gamut from aerospace (turbines) and automotive (custom race-car parts) to jewelry (custom titanium pendants) and tooling (inserts). EOS DMLS ductwork can be shaped exactly to fit an optimum air flow path, instead of having the design be driven by cutting paths or limited by minimum draft angles. Plus, EOS medical applications include custom knee joints and dental crowns and bridges.

The EOSINT M 270 has been



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## Rapid Tech /// Metal Manufacturing

a metals workhorse for years. Now joining that system, the just-announced EOSINT M 280 offers more options than ever for material choice: Because the M 280 unit can operate with either nitrogen or argon protective atmospheres, users can elect to work with light metals, tooling steel and super alloys including titanium, aluminum, cobalt chrome and Inconel (an iron-nickel combination).

#### **More Metal Methods**

UK-based MTT Technologies is known for its broad range of vacuum-casting, tooling, molding and selective laser melting systems. In April 2011, parent company MTT Investments announced its acquisition by Renishaw, a global engineering company with products in metrology, medical CAD/CAM and optical spectroscopy products.

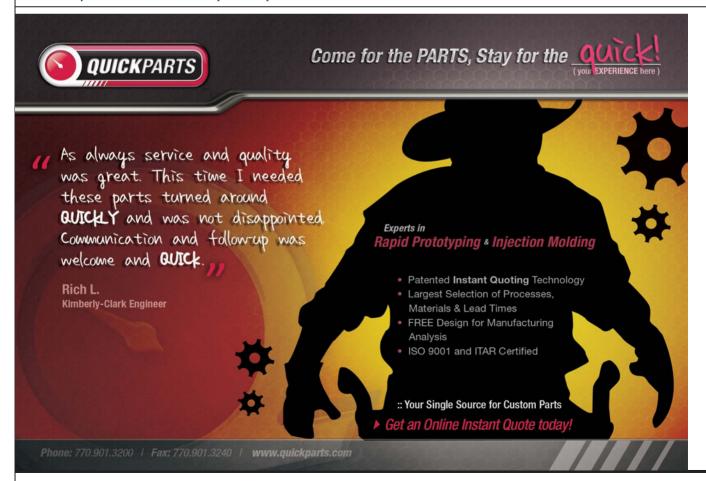
This broader corporate backing should help spread the use of the MTT SLM125 and 250 machines, both of which can process titanium, stainless steel, cobalt chrome and tool steel powders into fully dense parts. MTT/Renishaw has sold systems to several U.S. companies, and is currently looking here for additional demonstration partners.

Two other metal-oriented companies with laserbased systems are POM Group and Optomec. Their



The third-generation SLM 250 System from MMT Group

(now part of Renishaw). Enhancements over previous models include variable powder delivery, ultra-low oxygen content in the build atmosphere, and a safechange filter system to minimize user materials-contact. Image courtesy MTT/Renishaw.



processes and applications take metal powders into somewhat different and innovative directions, such as repairing worn or damaged expensive metal parts (including tooling). Both companies have developed technologies that fuse new layers of metal onto the surface of existing steel, titanium and nickel parts. The concept has been used to repair turbine blades, and even applies to reworking new parts that display out-ofspec dimensions.

POM Group's Direct Metal Deposition (DMD) 105D and Robotic DMD systems employ a fiber-coupled diode- or disc-laser to solidify injected metal powders, even combining metals for unique alloy properties. Typical markets include both part repair and the creation of conformal-cooling within injection molds. The company's closed-loop feedback system is the key for producing a near-net-shape product, including the capability to vary the melt-pool temperature to manage dissimilar substrates. An unusual aspect of the Robotic DMD unit is its portability, allowing machine transport for in situ repairs of massive tooling.

Optomec developed the Laser Engineered Net

#### **Finishing Touches**

hile many metal parts come out of AM systems ready to roll, others require — or at least benefit from—secondary processing. Check out these two very different options:

- DSM Somos has partnered with several service bureaus to provide a metal-cladding process on laser-sintered plastic parts. Termed MC2, for Metal Clad Composite, DSM Somos says this approach combines the best of two technologies to deliver metal performance — a highly stiffened, high-temperature part-via an electrically applied copper-nickel composite coating (DSMsomos.com).
- BESTinCLASS, a Swiss-based corporation, holds the intellectual property rights to a deburring/polishing method known as the Micro Machining Process (MMP). Described as a mechanical-physical-chemical surface treatment applied to items placed in a treatment tank, MMP provides a high-end polish that does not alter the mechanical properties of the treated part. The process works with a range of material-removal depths, and can be used on metals including gold, platinum, Inconel, steel and titanium. MMP processing is available in the U.S. through Microtek Finishing (MicrotekFinishing.com). -PJW

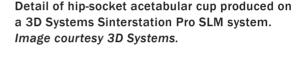


## Rapid Tech /// Metal Manufacturing

Shaping (LENS) technology that uses a highpower laser (500W to 4kW) to fuse a stream of powdered metals into fully dense parts. Working with such commercially available powders as 316 stainless steel, Inconel 625 and Ti6Al4V titanium, the company says its LENS-made parts feature a microstructure that improves their mechanical properties over similar parts made on other AM systems.

As food for thought, if you're willing to look abroad in your search, three additional European companies with laser/metal-powder systems are Phenix Systems in France and 3D-MICROMAC and Concept Laser in Germany. At press time, no U.S. distributors were listed on their websites.

The Ex One Co. may be the biggest U.S. rapid tech company you've never heard of. With 85% of its busi-



### **Up-and-Coming Rapid Metal Developments**

t press time, various state-of-the-art commercial programs were being discussed at the Additive Manufacturing International Conference at Loughborough University (AM-Conference.com). A number of companies and industrial groups that participated also support metalbased efforts that deserve a close look.

#### Check out the following:

- · fcubic (high precision ink jet manufacturing; Sweden): fcubic.com
- Intelligent Manufacture from Powder by Advanced Laser Assimilation (IMPALA), an EU collaboration based at TWI, UK: impala-project.eu.com/home/ home\_page\_static.jsp
- Fraunhofer Institute for Laser Technology (modifications to SLM equipment to permit using copper and copper alloys; Germany: ilt.fraunhofer.de/ eng/100000.html
- University of Louisville Rapid Prototyping Center (new materials for biomedical implants and aerospace/ defense structures using Laser Deposition and Laser Sintering): Louisville.edu/speed/rpc
- · University of Texas at Austin Cockrell School of Engineering (research including comparison of direct and indirect laser sintering of stainless steel): engr. utexas.edu. -PJW

ness in Europe — and much of it conducted through a service bureau program — Ex One comprises four divisions, including the industrial group ProMetal and its subdivision, Metaltec Innovations, which offers decorative hardware, tiles and art.

Ex One's powder-based process goes back to the early days of MIT's technology transfer program, when the company secured the license to use MIT's 3D Printing process with metals. Using a spray binder to form and combine layers of powdered metal, the ProMetal R-1 Direct Metal R&D Printer lets users create some of the largest parts in the rapid tech industry. Currently offered metals include a stainless-steel-bronze alloy, a high noble gold, copper tungsten and nickel. Printed parts are heattreated to achieve final density.

#### Variations on a Theme

Additive manufacturing via fused powdered metals, whatever the system used, presents challenges and trade-offs. Product designers and engineers should still consider two other approaches that put a twist on traditional metalworking: systems from Roland DGA and Solidica.

Roland DGA takes classic subtractive machining operations and packages them into a full software/ hardware solution that the company describes as combining the ease-of-use of 3D printers with the benefits of CNC-machined parts. No G-code (the common language for CNC programming) is required; tolerances and surface finish are excellent, and the Roland MDX 540 series handles machining standard materials from plastics to metals — including standard types of brass, aluminum and copper. The Roland website lists extensive data (under milling products), showing favorable ownership costs compared to those for a typical 3D AM system.

Solidica offers a very different approach to building parts. It uses an ultrasonic process to "consolidate" thin layers of metal drawn from featureless foil stock. The process produces true metallurgical bonds with full density, and can work with dissimilar metals. Solidica's Formation machine combines additive and subtractive processing to create deep slots, hollow, latticed or honeycombed internal structures and other complex geometries. The approach even allows embedding fibers and active devices such as sensors and other electronics.

#### **Rapid Service Bureaus**

Designers considering metal part production, either one-off or production, should consider outsourcing to service bureaus that work with AM systems dayin and day-out. A sampling of companies with extensive metal-working experience includes Accelerated Technologies (now part of 3D Systems), Grow It 3D, Harvest Technologies, Integra, Morris Technologies, Scicon Technologies and Solid Concepts. Two good directories for additional service bureaus are listed at Additive3D.com and TenLinks.com. Working with these experts also serves as a great entry path to identifying which system you'll purchase down the road.

#### **Fabrication Considerations**

No discussion of rapid metal-part production would be complete without mention of the impact that AM has had on casting techniques - and more specifically, on mold-making. The field widens to include quite a few more companies whose systems create parts useful as either direct, reusable injection molds (made of plastics or ceramics) or as intricate models for one-of-a-kind, lostwax casting.

Depending on the surface finish you require, you may find the perfect match for these applications with equipment from 3D Systems, Envisiontec, ExOne, Objet Geometries, Sintermask Technologies, Stratasys (especially with its recent acquisition of Solidscape) and Z Corporation. The dental and jewelry businesses are extensively tapping AM systems for fast, cost-effective, custom-volume manufacturing, but automotive, aerospace and art customers are coming on strong, too.

This is a great time to investigate metal options. See what rapid metal technology can do to transform your business. DE

Contributing Editor Pamela Waterman, DE's simulation expert, is an electrical engineer and freelance technical writer based in Arizona. You can send her e-mail to de-editors@deskeng.com.



An overview of multiple parts milled on Roland MDX-540 during a two-week period at Cardiovascular Systems, Inc., a medical device company. Images courtesy Roland DGA and Cardiovascular Systems, Inc.

INFO → 3D-MICROMAC: 3D-micromac.com

→ 3D Systems: 3Dsystems.com

→ Accelerated Technologies: ATIrapid.com

→ Arcam: Arcam.com

→ Concept Laser: Concept-Laser.de

Envisiontec: Envisiontec.com

→ EOS: EOS.info

→ ExOne: ExOne.com

→ Grow It 3D: GrowIt3D.com

→ Harvest Technologies: Harvest-Tech.com

→ Integra: Integra-Support.com

→ Morris Technologies: Morris Tech.com

→ Objet Geometries: Objet.com

Optomec: Optomec.com

→ Phenix Systems: Phenix-Systems.com

→ POM Group: POMgroup.com

Renishaw (MTT Technologies): Renishaw.com

→ Roland DGA: RolandDGA.com

→ Scicon Technologies: SciconTech.com

→ Sintermask Technologies: Sintermask.com

→ Solid Concepts: SolidConcepts.com

→ Solidica: Solidica.com

→ Stratasys (Solidscape): Stratasys.com

→ Z Corporation: Zcorp.com

For more information on this topic, visit deskeng.com.

# Autodesk Product Design Suite **Ultimate** 2012

Bundled titles address end-to-end workflow, from sketching ideas on digital napkins and prototyping designs in 3D to churning out photorealistic renderings.

#### BY KENNETH WONG

■ here's no question you're getting more bang (or byte) for your buck with Autodesk's suite deals, part of the company's 2012 releases. Take, for instance, the Product Design Suite 2012. The Ultimate Edition I'm examining for this article includes Autodesk Inventor Professional, Autodesk Alias Design, Autodesk 3ds Max Design, AutoCAD Mechanical, Autodesk Showcase, Autodesk SketchBook Designer, Autodesk Vault, and Autodesk Mudbox - a lineup that, according to manufacturer suggested retail prices, would

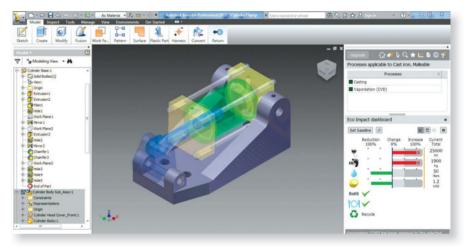
cost you more than \$21,000 if purchased separately. Bundle pricing is \$9,995, a deep discount of more than 50%.

The Product Design Suite is an indication of Autodesk's belief in — and commitment to — digital prototyping. The company envisions engineers and designers using a combination of conceptual sketching, 3D modeling, surfacing, rendering, and visualization tools to bring ideas to reality, with most of the creative process taking place in a digital environment.

For the Product Design Suite, the workflow may look like this: You use SketchBook Designer to sketch out your ideas. You use Autodesk Inventor and AutoCAD Mechanical to translate your ideas into 3D prototypes and production drawings. If your design involves complex surfaces, you may use Alias Design to draw them. If your design requires organic shapes and features that cannot be easily produced in mechanical CAD programs, you may turn to Autodesk Mudbox to digitally sculpt them. To turn your design into eye-catching presentations, you may use 3ds Max and Showcase to render them into photorealistic images and animations. Throughout the process, if you need data management at a workgroup level, you may rely on Autodesk Vault.

#### The Cocktail Napkin

Autodesk SketchBook Designer is a professional-level 2D



Autodesk Inventor 2012 marks the debut of Eco Materials Adviser, a sustainable design solution nested in CAD.

sketching package with a simple, straightforward interface (something of a rarity in professional software). In SketchBook Designer, you work with Spline curves. True, you can also create similar curves — even similar sketches — in other vector drawing programs from graphics software makers (like Adobe Illustrator, ACDSee's Canvas, or Corel's CorelDRAW). However, in my experience, SketchBook Designer's method of drawing, reshaping, and refining Splines using control points is incredibly effective. The curves produced in SketchBook Designer are extremely responsive and malleable. In many drawing programs, editing a curve at several points could lead to awkward segments and broken curvature continuity. In SketchBook Designer, I found that the software is able to resolve related tangents with grace and style to preserve the smooth flow.

Another imaginative feature in SketchBook Designer is the Symmetry command. With this command activated, whatever you draw on one side of the digital canvass is reproduced on the opposite side in reverse. The feature will be useful for sketching out designs with symmetrical geometry.

#### The Core of the Suite

In Autodesk Inventor, the core of the Product Design Suite 2012, you'll find a few subtle but effective interface improvements. In editing standard features (such as blends and holes), you'll find that the mini toolbar — a stack of floating menus that let you specify the desired parameter, select the desired element, select the desired tangent or trim treatment, and accept or reject the preview — makes it easy to execute an entire chain of actions with reduced mouse clicks.

You can also activate the marking menu, as Autodesk calls it, by right clicking in any empty space outside the model. This presents you with a series of options in a circular layout, which provides you with an easier way to cycle through applicable choices and select the one you need.

In adding fillets, you now have the option to add G2 continuity fillets, which gives you smoother transition and curvature so there's no detectable seams between faces. In visual style (View > Appearance > Visual Style), you can turn on ray tracing by selecting the Realistic mode, along with ground plane reflections and shadows. This, however, will demand a significant amount of computing power, so if you have a slower system with limited memory, you may want to use this function judiciously.

#### **Fusion Freedom**

Inventor Fusion, once an Autodesk Labs product experiment, has been graduated as a regular feature of Inventor. Now, you can invoke Fusion's direct-editing environment with a single menu button (called Fusion) on the main menu. (Note that installing Autodesk Inventor doesn't automatically give you direct editing functions. To use this function, you must select Inventor Fusion during the installation process.) Fusion edits are performed in a separate program window, not inside Inventor's classic parametric modeling window.

You might recall that, last year, Autodesk released an Inventor plug-in called Alias Design for Inventor, which let you perform freeform edits on your Inventor models. Now, many of the features found in Alias Design for Inventor have been incorporated into Inventor Fusion. For instance, while working in Fusion mode, you can use the Edit Edge command to reshape the geometry as a freeform object, pushing and pulling control points to create curvatures and surfaces not often available in a typical mechanical design program.

Fusion-edited parts can be imported back into Inventor's parametric environment for further work with a single click, through a command called Return to Inventor in Fusion. When you do, you'll notice that the edits you made in Fusion are now part of your model's feature tree. If your edits cannot be translated into parametric steps (for instance, relocating a hole to a new position or deforming a face in freeform mode), you'll see them listed as Alias Freeform features.



Autodesk Showcase lets you create still images and short animations using your CAD files.

#### **Eco Advice**

The Autodesk-Granta Design partnership that began roughly six months ago is finally bearing fruits. The outcome is Eco Materials Adviser, a sustainable design feature now available inside Inventor (Environments > Begin > Eco Materials Adviser). Once you've identified the part you wish to analyze, you can verify the designated material and manufacturing process. Info sheets available on the materials give you greater insight into their impact on the environment. If there's no manufacturing process specified, Eco Materials Adviser will offer a list of logical choices associated with the chosen material (for example, metal powder forming, forging, and vaporization for stainless steel).

Based on the geometry of your design, material choice, and manufacturing process, the application deduces manufacturing cost, water usage, energy usage, and CO<sub>2</sub> footprint. Where applicable, you may also verify if the materials you've chosen are Restriction of Hazardous Substances (RoHS) compliant or not.

The results of your initial eco analysis will be used as baseline, the standard used to measure other scenarios. Once you've obtained your baseline, you may switch to an alternate material, alternate process, and then update the dashboard to see if the changes have made your design's environmental impact higher or lower. (For instance, does the new material and process you've chosen reduce the amount of energy and water used?)

You may continue to experiment with different design scenarios till you feel you have struck the right balance among cost, energy use, water use, and carbon footprint. If you're at a loss on how to identify an alternate material, you may use Eco Materials Adviser's search function to search for a new type by tensile strength, carbon footprint, unit cost, and a host of other factors.

Currently, Eco Materials Adviser only gives you a way to compare the impact of using different materials on the same geometry. So if you need to compare the outcome of two different geometric designs in Eco Materials Adviser (for example, the environmental impact of two versions of the same shelled part, with different wall thicknesses), you'll have to run two separate analysis sessions, obtain reports for both, and compare them on your own.

## Computer-Aided Design /// Review

#### **Easier Motion Simulation**

One of the greatest pains of simulating assembly motion is the need to manually specify and define the type of joins connecting adjacent faces and subassemblies. In Inventor 2012, you can place a checkmark next to the Automatically Convert Assembly Constraints to Joints to turn the degrees of freedom specified in your assembly into standard joints.

Conversely, if you'd like to define a specific type of joint, you can override the automation by unchecking this option. You'll find this command under Environments > Begin > Dynamic Simulation > Manage > Simulation Settings.

#### On the Surface

The inclusion of Alias Design in the Product Design suite is an indication that in certain industries, such as consumer goods and automotive, complex surfaces have become more than optional aesthetic treatment. They've become a competitive advantage to make your product stand out.

Autodesk has probably noticed that some of its customers are turning to rivals' products (most notably, Rhino) to create complex surfaces that cannot be easily designed in mechanical design software. By bundling Alias Design with Inventor, Autodesk is creating a combo that addresses both freeform modeling and precision modeling, giving its customers one less reason to defect.

However, bear in mind that Alias' interface is dramatically

different from a typical CAD modeling interface or a rendering program interface. Most likely, when working in Alias, you'll create complex surfaces by stitching together splines or manipulate existing shapes by pushing and pulling the control vertices (CVs) around them. This method of modeling is quite different from the sketch-based extrusions and precision-modeling operations in parametric CAD. So if you're brand new to Alias, be prepared to spend some time watching tutorial videos and performing the beginner's exercises prescribed by the online Wiki.

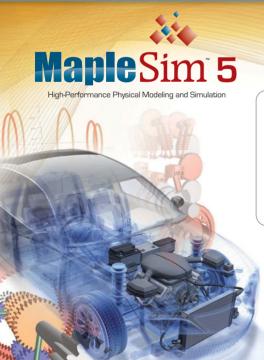
#### **Showing Off**

For the more ambitious engineers and designers who'd like to create sophisticated animations and renderings, Autodesk 3dx Max is ideal. Rooted in the company's media and entertainment division, 3dx Max gives you the same toolsets Oscar-winning animators, filmmakers, and digital artists have been using.

For those who prefer instead a low learning curve and quickand-easy package to create brochure-worthy renderings, Showcase is a better alternative. When initiating a new scene, Showcase gives you the option to import files directly from Autodesk applications, including Inventor (mechanical design) and Revit (architecture). During import, you'll get the option to immediately translate assembly constraints into animation-ready behaviors.

Showcase comes with preloaded materials and environments you can drag and drop into the scene to add flair to

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your CAD models. In the Present mode, you have the option to view two scenes side by side for comparison — a useful feature if you're having trouble deciding between two different colors or finishes. Once your scene looks right, you may create a still image, a cinematic orbit, or a short movie sequence with start and end positions.

#### **Licensing and Installation**

Though it comprises a generous list of software titles, Autodesk Product Design Suite is still a single-seat license. If you're thinking of, for instance, installing different titles on separate machines (say, Inventor on PC No. 1, 3ds Max on PC No. 2, and Alias on PC No. 3) and sharing them among three users, it won't work. The install mechanism will restrict you to installing the content of the entire suite in a single machine. Compared to some of its rivals' products, Autodesk Product Design Suite proves quite easy to install. The process is made easier in Release 2012 by the fact that, now, the installation files come on a small, portable USB drive — not a big stack of DVDs.

Autodesk has put in considerably effort to make titles in the suite interoperable and complementary. However, it's difficult to imagine someone with expertise that spans across all the titles included in the suite. Most likely, you're an expert in some of the titles, an intermediate user in others, and a beginner to a few. You can become productive with easier titles in the bundle with little or no training (Autodesk SketchBook Designer, for instance), but certain professional titles (such as Autodesk 3ds Max Design and Autodesk Alias Design) may require considerable time and effort to master. Getting a lot more code for a little bit of extra cash is a good deal if you have a workflow that can fully take advantage of the suite's comprehensive content. DE

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 email him via deeditors@deskeng.com.

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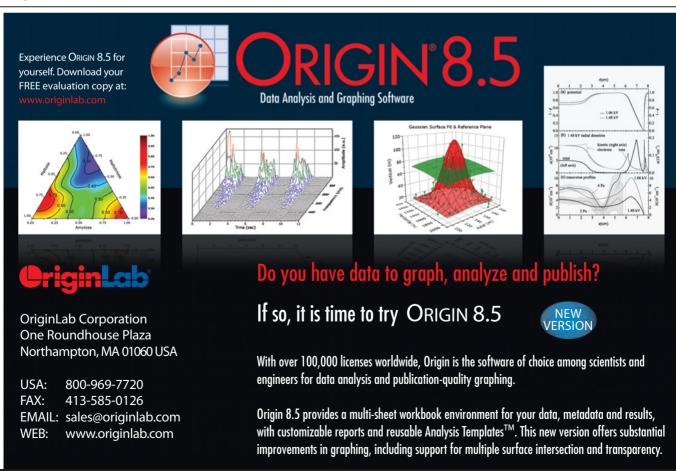
→ ACDSee: <u>acdsee.com</u>

→ Corel: corel.com

→ Granta Design: grantadesign.com

→ Rhino: rhino3d.com

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## Simulation & Analysis /// Review

# Pack a 1-2 Punch

Build a mathematical model with Maple 15, then execute it with MapleSim 5—quickly and easily.

#### BY PETER VARHOL

n college, we learned engineering analytically, solving increasingly sophisticated structural, mechanical and electrical problems by formulating equations. Once in an engineering job, however experience starts to take over. In many cases, you do less analytical solutions and more realworld problem solving.

Maple and its simulation add-on, MapleSim, help bridge those two worlds, with the analytical tools to bring a level of precise computation to engineering problems along with the flexibility to incorporate engineering experience into designs. Manufac-

tured by Waterloo, Ontario-based MapleSoft, Maple is the analytical engine, a symbolic math machine that enables engineers to set up and solve problems as a series of equations. MapleSim can then take those solutions and execute them as parts of larger models that accurately execute those solutions over a range of parameters, providing a simulation as detailed as the equations themselves.

The result is a combination of mathematical tools for engineers, with the ability to build and execute models of complex real-world systems. While Maple is used for a lot of designs and simulations within the automotive industry, these tools can be applied to any engineering problem that requires sophisticated mathematics.

I used Maple 15, MapleSim 5 and the new MapleSim 3 on an HP engineering workstation, the Z600 model with dual 64bit Intel Xeon processors, each with two cores, running at 2.8 GHz, with 12GB of memory. Installation of both products and license activation took only a few minutes, with no problems. This fast system ran Maple and MapleSim very well, with even the most complex calculations completed and displayed within a second or two. MapleSoft says that it has redesigned the math engine for many of the solvers, and claims the best



MapleSim 5 includes improvements to the 3D modeling environment that make it even easier to construct and explore 3D models - including the ability to export 3D animation simulation results as movies.

performance of any similar solution. While I didn't time the computations, execution of even relatively complex symbolic computations occurred within a second or two. On my midrange engineering workstation, it's certainly fast enough for just about any design.

One of the most important enhancements for Maple 15 is that it automatically utilizes all workstation processors and cores for computations that can take advantage of them. This requires some intelligence in both algorithms and implementation, but it means that parallelism is abstracted from the engineering effort of solving the problem. If it works as cleanly as advertised, it is a big win for complex computations. I tried to capture a sense of parallel execution with a series of parallelizable matrix operations while capturing Perfmon core utilization data, and saw multiple cores in use.

Further, Maple 15 allows you to launch multiple processes on all the cores of the desktop workstation, right from the user level without the need for any prior setup. The programming interface is the same as the one used for large-scale grid computing on a cluster or supercomputer, allowing engineers to easily prototype and test distributed code on the local workstation, then deploy the same code to a large grid or cloud.

#### **Working with Maple**

Maple lets engineers do a wide range of computations and analyses. You can do symbolic calculations — that is, calculations with variables rather than numeric values. But you can also create complex 2D and 3D graphs of those equations, modify the graphs by modifying the equations, and animating the equations. Further, you can create custom "fly-throughs" of these animations, giving you a continuous view as you traverse the graph from one end to the other.

All of these computations are performed in a Maple work-book, which is effectively a blank page upon which you type equations. You can simply solve those equations, symbolically or definitively if you insert actual values, or you can produce graphs of the resulting solutions. Standard equation components are available in libraries so that you can, to some extent, pick and choose the equations you need, which saves time and improves accuracy.

Maple provides the symbolic solutions to computational engineering problems. It enables engineers to build mathematical analyses to solidify design decisions, rather than make estimates that often result in over-engineering. MapleSim takes the results of those analyses and creates a functional and working model out of the equations. You can then go one step further and simulate the operation of these models, both examining the model visually and producing data that can be evaluated separately.

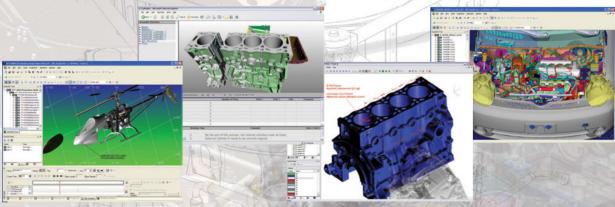
The improvements and changes in MapleSim 5 are significant. Open models lets you access model equations in full parametric form, and it automatically simplifies equations with no loss of fidelity. In other words, if a given simulation doesn't include certain parameters, MapleSim has the ability to reduce the equations to exclude them, improving simulation performance.

MapleSim includes component libraries in areas such as magnetics, thermofluids, fluids, expanded electrical, and mechanical modeling. It enables 3D multi-body and 1D multi-domain in single environment, so that systems can be simulated more completely. Last, it generates code in C, MathWorks Simulink, National Instruments LabVIEW and dSPACE. Code produced by simulations can be used for hardware-in-the-loop operations, or even as embedded code in actual systems.

MapleSim Product Manager Derek Wright notes that individual engineers are being thrust into systems engineering roles beyond their specialties, as today's complex systems combine mechanical, electrical and other components.

"Engineers need to be able to abstract away from the details somewhat to be able to integrate mechanical systems, electrical systems, computer software and other components into a completely engineered system," he says.



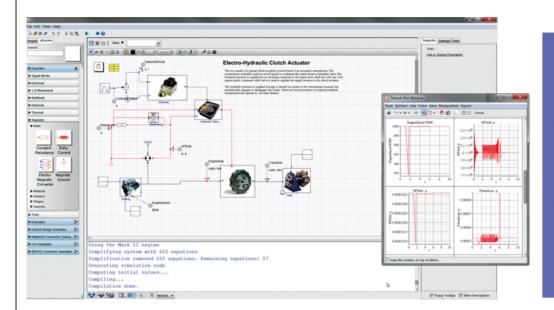


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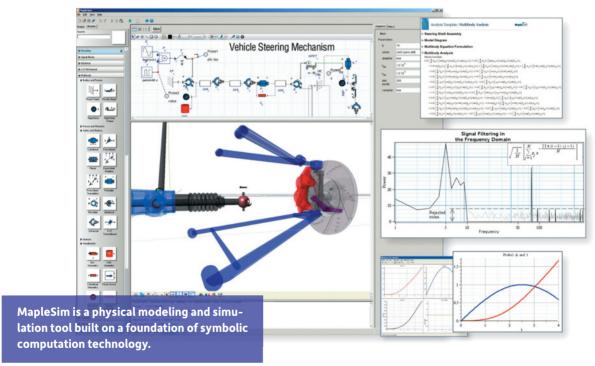
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## Simulation & Analysis /// Review



MapleSim's multidomain modeling environment lets you combine elements from different domains into a single model. This electro-hydraulic clutch actuator includes components from the new magnetics library in MapleSim 5, as well as electrical, mechanical and hydraulic components.



Engineers can design according to their expertise, then integrate that design with pre-built components from the components library, or with components built by other engineering teams, to produce a full system. For example, an electrical engineer could design an electronic system for an aircraft fly-by-wire system, down to the circuit level. However, that engineer probably doesn't have the skills to consider the aerodynamics of the aircraft using the system. These designs can be accomplished in Maple by a separate team, and incorporated as a black box component in the electronic feedback system by the electrical engineer.

#### **Models for HIL Simulations**

MapleSim adds an interface supporting dSPACE, a commonly used hardware-in-the-loop (HIL) development environment for embedded systems. This interface makes it possible to build out part of a hardware prototype, and insert MapleSim models to simulate the components under design — resulting in a system that is both real and modeled. The physical part of the system is often a harness or test bed that recreates known parts of the system, responding to or providing feedback to the running model to test its accuracy or other characteristics.

In support of HIL uses, MapleSim also generates code in

several different programming languages. In addition to the ones noted above, the package can also produce traditional third-generation languages such as Java and C#, making it possible to run conventional code in embedded systems. It also includes an automotive driveline component library, which helps engineers design automotive products such as braking systems and drivetrains. These components enable engineers to work with standard models with known behaviors, which can easily be plugged into custom models to build and simulate more quickly.

The result is that those who use mathematical models as part of HIL simulations can use MapleSim to build models that fit right into their simulation harness. It makes it possible to understand the parameters of the design early in the process, and test out alternative designs later on.

#### **A Symbolic Math Foundation**

Learning Maple and MapleSim isn't difficult; most engineers familiar with the mathematics of their profession can be reasonably up to speed in a matter of days. Thanks to a broad array of examples, tutorials and courses, visual components, pre-defined equations, built-in libraries and other features, technical professionals can make use of it immediately, and enable their skills to grow with use. Help is also available through the Maple and MapleSim Application Center and

MapleCloud; Wright told me that engineers have contributed a large number of applications and components for use by the community at large.

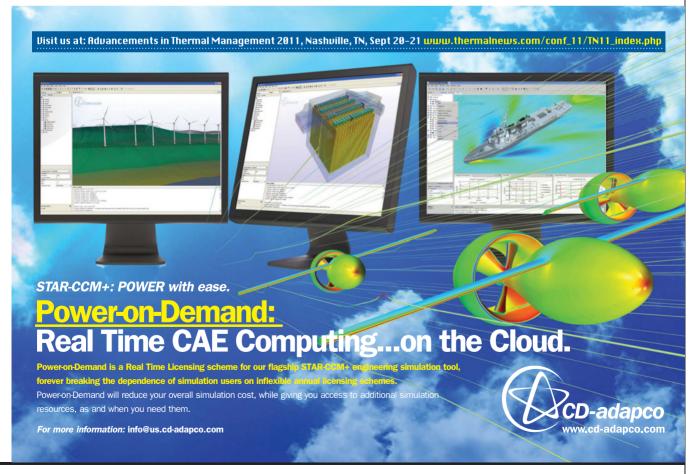
The primary advantage in using Maple and MapleSim is that it enables engineers to more quickly and precisely build and test models of complex designs. Doing the required math is so easy with these solutions that engineers can look at multiple design approaches and models, and still be assured that they aren't over-engineering.

However, there are other advantages as well. The ability of engineers to integrate a comprehensive design across different engineering specialties is an important one, as is the ability to easily share designs, create powerful simulations, and use code embedded in electronic and electromechanical designs. Engineers seeking better designs through mathematical analysis and simulation can look to Maple and MapleSim as possible solutions. DE

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INFO -> MapleSoft.com

For more information on this topic, visit deskeng.com.



## High-Performance Computing /// Workstation Review

# More Bang for the Buck

The over-clocked Xi MTower PCIe Workstation from @Xi Computer delivers fantastic price and performance.

#### **BY DAVID COHN**

alifornia-based @Xi Computer Corp. (pronounced "at-ex-eye") has been building workstations since May 1992. At one time, I even owned one. Yet I couldn't remember the last time I reviewed one of the company's computers.

The Xi MTower PCIe workstation is housed in a Cooler Master

> HAF 912 case with four front panel bays and six internal drive bays. The perforated grills in the top and side aid cooling, but don't help muffle internal fan noise. Photo courtesy of David Cohn

Needless to say, I was quite interested when DE received one of @Xi's latest Intel-based workstations, the Xi MTower PCIe — powered by a 3.4GHz Intel Core i7 2600K quad-core CPU. That processor, based on Intel's newest Sandy Bridge architecture, has a maximum turbo frequency of 3.8Ghz.

Sandy Bridge brings the memory controller and PCIe controller onto the CPU die, and also includes on-board graphics, although CAD and DCC users will still want to equip their systems with a discrete workstation-class graphics accelerator. The Core i7 2600K also incorporates an 8MB SmartCache.

But the big news is that the "K" in the CPU's name means that the chip has an unlocked multiplier, making it easier to overclock this processor. That's just what @Xi did, boosting the system to 4.1GHz.

The Xi MTower PCIe came housed in an HAF 912 case manufactured by Cooler Master. The charcoal gray tower measured 8.6x19.4x18.0 in.; the system weighed 33 lbs. A small panel at the top of the front bezel contained a pair of USB ports, microphone and headphone jacks, and both a power and separate reset button. Below this were four 5.25-in. drive bays with front-panel access. The top-most bay contained an 18X Liteon dual-layer DVD+/-RW drive.

#### **Some Assembly Required**

When we first removed the workstation from its packaging, a note warned that before powering the computer on for the first time, we needed to open the case to remove spacers that were installed inside to absorb shocks during shipping. The left panel of the Cooler Master case was held in place by two non-captive thumbscrews. After removing these and putting them safely aside so they wouldn't get lost, we opened the case and removed three foam rubber blocks.

The Intel Core i7 2600K CPU requires a larger heat sink and fan than earlier processors. Because the CPU in the MTower was overclocked, rather than use Intel's thermal





- ↑ Inside the Xi workstation, a large Cooler Master heat sink conceals the over-clocked Intel Core i7 2600K CPU (upper left), while the Corsair fan unit that we had to assemble and mount to its right cools the system memory concealed beneath.
- The ASUS P8P67 motherboard provides a host of on-board features, enabling lots of rear panel connections and plenty of expandability. Photos courtesy of David Cohn

solution, @Xi included a Cooler Master V6 GT heat sink. This 5-in., cube-shaped device with two large fans mounts on top of the processor, completely hiding it from view. It was this contraption that the foam blocks were supporting during shipping.

@Xi assembles its systems from standard components, and includes all of the manuals and extra nuts, bolts, etc., that come with those parts. When we unpacked the MTower, residing among all of the spare parts and cables was a box containing a Corsair AIRFLOW memory cooling fan, along with yet another note informing us that we needed to go to a link on the @Xi website to watch a video explaining how to assemble and install this component. The resulting installation process took just a few minutes, but the device really didn't attach very firmly to the memory sockets.

#### **Room for Expansion**

Inside the well-organized case, we had easy access to the six internal drive bays, one of which contained the system's boot drive: a 120GB Corsair Force Series F120 solid-state hard drive. This 2.5-in. form factor device has a maximum read speed of 285MB/second, and a lifespan rated at more than 1 million hours mean time between failures. A second bay held a Western Digital 1TB 7200rpm SATA hard drive for use as a data drive. This still left lots of space for us to add additional storage. A Cooler Master SilentProM 1,000 watt power supply was tucked neatly into the bottom rear corner of the case, and provides ample power for future additions.

The new Intel Sandy Bridge processors cannot be plugged into the same LGA1156 socket used for Intel's last generation of "Westmere" family CPUs, but rather requires the new LGA1155 socket. For that reason, the Xi MTower PCIe was assembled around an ASUS P8P67 motherboard with an Intel P67 Express chipset. The ASUS motherboard provided a total of seven expansion slots: one PCIe X16 slot (x16 electrically), a second X16 slot (x4 electrically), a pair of PCIe X1 slots, and three PCI slots. One PCIe X16 in our evaluation unit was filled with an NVIDIA Quadro 5000

## High-Performance Computing /// Workstation Review

graphics accelerator, a double-width board that covered the adjacent PCIe X1 slot. @Xi also offers a range of other graphics accelerators from both ATI and NVIDIA. With 352 GPU cores and 2.5GB of GDDR5 video memory, the Quadro 5000 also requires auxiliary power.

The ASUS motherboard also provides four dual inline memory module (DIMM) sockets, and supports up to 32GB of system memory using 8GB DIMMs. Our evaluation unit came with 16GB of RAM, installed as four 4GB 1,333MHz DDR3 DIMMs. The motherboard also supports up to eight SATA drives and includes a Realtek 8111E Gigabit LAN controller, a Bluetooth v2.1 controller, a Realtek 8-channel high-definition audio CODEC with DTS surround sound and jack-detection/

retasking, an on-board IEEE 1394 controller supporting up to two FireWire ports, and an NEC USB 3.0 controller — in addition to the USB 2.0 support built into the Intel P67 chipset.

All of this on-board support was put to good use, as the rear panel offered PS/2 mouse and PS/2 keyboard ports, an optical S/PDIF out port, Bluetooth module, eight USB 2.0 ports, two USB 3.0 ports, an IEEE 1394a port, an RJ45 LAN port, and six audio ports — including line-in, lineout/front speaker out, microphone, center/subwoofer, rear speaker out, and side speaker out providing support for 2-, 4-, 6- or 8-channel audio configurations. The NVIDIA Quadro 5000 graphics card has one DVI-I connection, plus two DisplayPorts.

### **Design Engineering Workstations Compared**

		@Xi Computer Xi MTower workstation (one 3.4GHz Intel Core i7 2600K quad-core CPU over-clocked to 4.1GHz, NVIDIA Quadro 5000, 16GB RAM)		BOXX 3DBOXX 8550XTREME workstation (two 3.33GHz Intel Xeon X5680 six-core CPUs over-clocked to 4.2GHz, NVIDIA Quadro 5000, 24GB RAM)		Dell T5500 workstation (two 3.33GHz Intel Xeon X5680 six-core CPUs, NVIDIA Quadro 5000, GGB RAM)		Digital Storm PROTUS 220060 Workstation (one 3.33GHz Intel 17-X980 six-core CPU, NVIDIA Quadro FX 3800, 12GB RAM)		BOXX 3DBOXX 4860 Extreme workstation (one 3.33GHz Intel i7-X980 six-core CPU (over- clocked to 4.15GHz), NVIDIA Quadro 5000, 12GB RAM)		Lenovo E20 workstation (one 3.19GHz Intel i5650 dual core CPUs. NVIDIA Quadro FX 580 4GB RAM)	
Price as tested		\$4,465		\$11,396		\$9,240		\$6,545		\$6,325		\$1,224	
Date tested		4/30/11		3/20/11		1/14/11		12/13/10		11/14/10		9/15/10	
Operating System		Windows XP	Windows 7 64-bit	Windows XP	Windows 7 64-bit	Windows XP	Windows 7 64-bit	Windows XP	Windows 7 64-bit	Windows XP	Windows 7 64-bit	Windows XP	Windows 7
SPECviewperf	higher												
3dsmax-04		n/a	89.36	95.97	95.44 <sup>1</sup>	76.05	78.72	88.15	87.07	n/a	90.25	66.73	64.98
catia-02		n/a	121.7	120.44	121.1	98.48	100.25	75.35	84.85	n/a	115.36	68.28	63.79
ensight-03		n/a	131.19 <sup>1</sup>	132.41	130.13	118.29	121.70	62.22	58.33	n/a	120.41	45.79	43.40
maya-02		n/a	465.88	529.89	476.95 <sup>1</sup>	490.95	435.44	174.45	218.33	n/a	458.21	185.81	157.57
proe-04		n/a	128.25	113.84	113.24	92.19	90.61	83.16	77.29	n/a	114.34	64.08	59.17
SW-01		n/a	239.78	221.31	214.06	180.49	169.75	174.74	157.70	n/a	233.03	97.07	89.67
tcvis-01		n/a	97.45	98.58	94.17	93.99	90.34	40.16	37.36	n/a	95.26	23.66	23.00
ugnx-01		n/a	88.87	89.32	86.90	89.31	87.95	37.46	35.49	n/a	88.75	23.15	16.93
SPECapc SolidWorks	lower												
Score	seconds	n/a	n/a	106.56	n/a	146.86	n/a	106.51	n/a	n/a	n/a	153.29	n/a
Graphics	seconds	n/a	n/a	35.33 <sup>1</sup>	n/a	58.42	n/a	32.17	n/a	n/a	n/a	58.71	n/a
CPU	seconds	n/a	27.48	25.99 <sup>1</sup>	n/a	32.27	n/a	26.87	n/a	n/a	31.63	33.67	n/a
I/0	seconds	n/a	49.48 <sup>1</sup>	46.51 <sup>1</sup>	n/a	60.76	n/a	47.99 <sup>1</sup>	n/a	n/a	54.68	65.44	n/a
SPECapc SolidWorks	higher												
Score	ratio	n/a	n/a	8.23	n/a	5.32	n/a	8.04	n/a	n/a	n/a	5.21	n/a
Graphics	ratio	n/a	n/a	6.08	n/a	3.23	n/a	6.07	n/a	n/a	n/a	3.25	n/a
CPU	ratio	n/a	11.74	12.61	n/a	10.00	n/a	12.01	n/a	n/a	10.20	9.58	n/a
I/0	ratio	n/a	6.40	6.81	n/a	5.21	n/a	6.60	n/a	n/a	5.79	4.84	n/a
Autodesk Render Test	lower												
Time	seconds	n/a	49.8 <sup>1</sup>	34.0	19.01	42.0 <sup>1</sup>	28.0 <sup>1</sup>	53.5 <sup>1</sup>	46.3 <sup>1</sup>	n/a	39.6	222.3	203.0

Numbers in blue indicate best recorded results. Numbers in red indicate worst recorded results. 1: Hyper-threading enabled.

#### Remarkable Performance

Thanks to the solid-state hard drive, it took less than 30 seconds from the time we powered up the Xi MTower PCIe workstation until Windows 7 was ready for us to start working.

Although the MTower was equipped with the same NVIDIA Quadro 5000 as the systems we've recently tested from BOXX and Dell, it had just a single quad-core CPU compared to the dual six-core CPUs in the Dell T5500 and 3DBOXX 8550XTREME workstations. While we were expecting to see decent performance, particularly since the Intel Core i7 2600K processor in the MTower was overclocked to nearly the same speed as the Intel Xeon X5680 in the BOXX workstation, we didn't expect the MTower to set any records.

Boy, were we surprised.

On the SPECviewperf test, which focuses solely on graphics performance, the Xi MTower managed to set new high-water marks for three of the eight datasets in the test, and ranked close to the top on several others.

Unfortunately, @Xi did not provide us with a dual-boot system, so we were unable to obtain a complete set of valid result for the SPECapc SolidWorks benchmark. This test breaks out the graphics, CPU and I/O performance separately from the overall score. While we couldn't use the overall or graphics scores, the CPU and I/O results were, again, right near the top.

It was only when we turned our attention to our own AutoCAD rendering test, which clearly shows the advantages of hyper-threading, that the Xi MTower PCIe workstation lagged behind. Because it had the equivalent of only 8 CPU cores with hyper-threading enabled, compared to 24 on the BOXX and Dell workstations, it took nearly 50 seconds to complete the test rendering. Still, that proved to be the best results we've ever recorded for a system with a single quad-core CPU.

Because the MTower had an over-clocked CPU, @Xi made sure the system had lots of cooling. We counted no fewer than eight fans: one in the front panel and one on the rear, two in the large Cooler Master CPU heat sink, two more in the Corsair memory cooling module, one in the power supply and one in the NVIDIA Quadro 5000. Although the system was relatively quiet when idling, once we started running our tests, we could definitely hear all of those fans. With a large perforated grill in the top and a second in the removable side panel, the Cooler Master HAF 912 case provides little acoustic control.

Our evaluation unit came with Windows 7 Professional Edition 64-bit pre-installed, and @Xi included the actual Microsoft DVD and certificate of authenticity. Other versions of Windows and several flavors of Linux are also available. In fact, you can choose from a wide range of options on the @Xi website. For example, our evaluation unit came with a wonderful Logitech cordless desktop MK710 keyboard and

matching laser mouse, which added \$95. The standard @ Xi warranty only covers the system for one year, in spite of the fact that many of the systems' components have longer warranty periods if purchased separately. For an additional charge, @Xi offers warranties of up to four years, as well as on-site service.

Although the base price for the Xi MTower PCIe workstation is just \$1,119, we expected the cost of our evaluation unit to be much higher. The NVIDIA Quadro 5000 alone added \$1,999 to the price. But at \$4,465 for the system as tested, the Xi MTower PCIe delivers more bang for the buck than any other system we've tested recently. DE

David Cohn is the technical publishing manager at 4D Technologies. He's a contributing editor to Desktop Engineering and also does consulting and technical writing from his home in Bellingham, WA. The author of more than a dozen books has been benchmarking PCs since 1984. You can contact him via email at david@dscohn.com or visit DSCohn.com.

INFO → @Xi Computer Corp.: XiComputer.com

#### Xi MTower PCIe workstation

Price: \$4,465 as tested (\$1,119 base price)

#### **System Requirements**

- Size: 8.6x19.4x18.0-in. (WxDxH) tower
- Weight: 33 lbs.
- CPU: one Intel Core i7 2600K (quad-core) 3.4GHz (over-clocked to 4.1GHz)
- Memory: 16GB DDR3 ECC at 1333MHz (up to 32GB supported)
- Graphics: NVIDIA Quadro 5000 (one DVI port, two DisplayPorts)
- Hard Disk: Corsair Force Series 120GB solid-state SATA drive, Western Digital 1TB SATA 7,200rpm drive
- Optical: Liteon 18X DVD+/-RW Dual-Layer
- Audio: on-board integrated high-definition audio (microphone and headphone on front panel; optical S/ PDIF out, line-in, line-out/front speakers, microphone, center/subwoofer, rear speakers, and side speakers on rear panel)
- Network: integrated 10/100/1000 LAN with one RJ45 socket
- Other: PS/2 keyboard, PS/2 mouse, two USB 2.0 on front panel, eight USB 2.0 on rear panel, two USB 3.0 on rear panel, one IEEE 1394a on rear panel, Bluetooth module on rear panel
- Keyboard: 105-key Logitech MK710 cordless keyboard
- · Pointing device: Logitech M705 laser mouse

## High-Performance Computing /// Graphics Cards Review

# Dual Graphics Engines Power new Boards from **AMD**

AMD drops the ATI brand for its latest updates to the FirePro graphics series.

#### BY DAVID COHN

MD recently began rolling out its latest generation of professional workstation-class graphics products targeted at the CAD, CAE and DCC markets. The new AMD FirePro V7900 and AMD Fire-Pro V5900 were announced in May. We received the new boards for evaluation shortly thereafter — and quickly put them to the test.

While the new graphics accelerators are the latest in the FirePro family, one of the first visible differences from earlier-generation cards is the adoption of the AMD brand as the older ATI brand is retired. AMD acquired ATI in 2006, and discontinued the brand name late last year.

The two new FirePro boards are the first in the family to be based on AMD's new Cayman architecture. These new offerings supplant the ATI FirePro V7800 and V5800 that we reviewed last year (see October 2010 DE). Both of the new boards feature AMD Eyefinity, AMD PowerTune and AMD GeometryBoost technologies. They also support the latest DisplayPort 2.1 speci-

Graphics boards once relied on dedicated geometry engines and pixel shaders. That all changed with the introduction of unified graphics architectures in which the power of the graphics processing unit (GPU) can be dynamically allocated to vertex or pixel shading. AMD calls its unified shader architecture Stream processors.

As you would expect, both of the new boards outperform their predecessors, but manage to do so thanks to the new GPU architecture rather than an increase in the number of processors in the GPU. Both boards now come with 2GB of GDDR5 memory, but the processor count has actually gone down compared to the previous The mid-range AMD FirePro V5900. Photo courtesy of AMD.

generation. Yet by reducing the size of the GPU die and enabling higher utilization of the processors, both boards scored higher compared to last year's offerings.

#### **New AMD Graphics Technologies**

First introduced to professional GPUs with the previous generation ATI FirePro Vx800 series, AMD's Evefinity technology enables one V5900 board to power three simultaneous displays; the V7900 supports up to four separate monitors.

AMD's PowerTune technology helps deliver higher performance optimized to the thermal limits of the GPU by dynamically adjusting the processor's clock in real-time, based on internally calculated GPU power usage. Rather than constraining performance so that the board doesn't exceed its maximum thermal design power (TDP), the new boards are able to reach higher clock speeds and adjust to remain within TDP limits. This helps the boards deliver optimum performance without increasing their power consumption.

The AMD FirePro V7900 and V5900 cards also implement the new AMD GeometryBoost technology, enabling them to process geometry data at up to twice the rate of previous-generation GPUs. This was accomplished by using dual graphic engines in the new Cayman architecture, which allows graphics workloads to be

divided more efficiently.

Both the V5900 and V7900 integrate support for the new revision 1.2 of the DisplayPort specification, which was ratified by the Video Electronics Standards Association (VESA) in early 2010. The new standard supports up to twice the bandwidth and video data rate compared to the earlier DisplayPort standard.

## The Newest Members of the AMD FirePro V Family

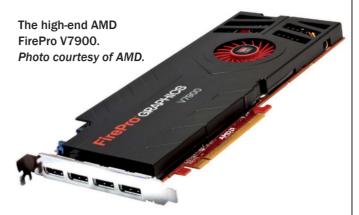
The new mid-range AMD FirePro V5900 replaces last year's ATI FirePro V5800. With a manufacturer's suggested retail price of \$599, the new board is priced \$130 higher than its predecessor. That seems reasonable, considering that the V5900 is equipped with 2GB of GDDR5 memory — double the V5800. With an average street price of \$459, the new board actually costs around \$50 more than last year's model. But that \$50 will buy you a fairly significant improvement in performance, assuming it's installed in a system with PCI Express 2.1 support.

The total number of Stream processors drops from 800 to 512, but doubling the memory interface to 256 bits enables the V5900 to retain the same 64 GB/second memory bandwidth as its predecessor. Power consumption also remains nearly identical, enabling the FirePro V5900 to retain a single-slot form factor that requires no extra power beyond that supplied through the PCIe X16 slot.

Like the V5800 before it, the AMD FirePro V5900 provides one dual-link DVI output and a pair of DisplayPort connections. The V5900 also supports AMD CrossFire Pro, which enables users to harness the power of two GPUs by linking two identical FirePro cards together with the supplied connection cable. The board also comes with a DisplayPort to Single-link active DVI adapter.

At the high end, the AMD FirePro V7900 replaces last year's ATI FirePro V7800. Again, the new board carries a manufacturer's suggested retail price significantly higher than the board it replaces: \$999 compared to \$799 for the V7800. Even taking into account an average street price of \$759, the new board is approximately \$100 more expensive than its predecessor. But once again, the increased performance makes the new board a good investment.

The V7900 comes with the same 2GB of GDDR5 memory as the V7800, while the new GPU contains 1280 Stream processors, compared to 1440 in the V7800. Doubling the memory interface to 256 bits and better utilization of the GPU result in a memory bandwidth of 160 GB/second. At 150 watts, power consumption is a bit higher, but the V7900 still requires just a single PCIe X16 slot and one auxiliary connection to



the system power supply.

The V7900 also supports Framelock/Genlock with the addition of a FirePro S400 Synchronization Module. It even comes with an expansion bracket that provides a 3-pin stereo 3D connector, as well as an AMD CrossFire Pro connection cable.

One of the biggest differences between the V7900 and the V7800 is the elimination of native DVI output. The V7900 sports four DisplayPort connections, but also comes with four DisplayPort to Single-link active DVI adapters should you want to attach older monitors.

#### **Benchmarking the Boards**

We tested the two new AMD FirePro boards using the same system we've used for several years now for evaluating graphics cards: an HP xw6600 workstation equipped with a pair of 3.0GHz quad-core Xeon E5450 processors. While that system is certainly showing its age, using the same computer enables us to continue to compare our results to those of older boards from both AMD and NVIDIA, making it easy to see just how much these graphics accelerators have improved over the years. However, because AMD updated its driver software for the new boards, we also retested the previous generation of AMD/ATI graphics cards using the updated driver, so that we could determine how much things improved simply because of changes in the driver software.

Recognizing that many readers are likely using newer systems, however, we ran an additional set of tests using the BOXX 3DBOXX 8550XTREME workstation we recently reviewed (see May 2011 *DE*) similar to what we did for last month's look at the latest NVIDIA Quadro boards. The BOXX workstation was equipped with a pair of 3.33GHz Intel Xeon X5680 six-core CPUs overclocked to 4.2GHz.

We tested all of the boards using two different versions of the SPECviewperf benchmark. We used version 10 on the older HP workstation, running Windows XP 32 bit at 1280x1024 resolution, and the new Viewperf version 11 at 1680x1050 resolution on the BOXX work-

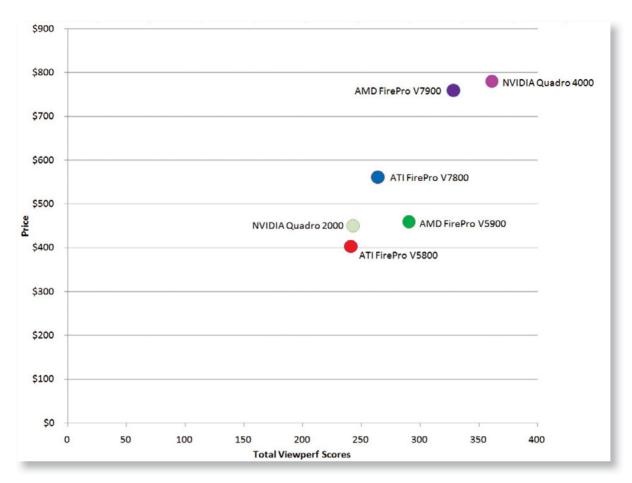
## High-Performance Computing /// Graphics Cards Review

## SPECviewperf benchmark results for latest ATI FirePro graphic cards reviewed

	AMD FirePro V7900 NEW!	ATI FirePro V7800	AMD FirePro V5900 NEW!	ATI FirePro V5800
Manufacturer's Price	\$999	\$799	\$599	\$469
Average Street Price	\$759	\$651	\$459	\$403
SPECviewperf 11.0 (Boxx 8550 XTREME)				
catia-03	24.69	20.57	21.76	18.87
ensight-04	41.56	22.91	31.97	17.34
lightwave-01	65.08	61.25	64.75	59.52
maya-03	75.56	61.29	64.74	56.17
proe-05	5.80	6.06	5.80	5.90
sw-02	56.62	47.14	53.23	44.61
tcvis-02	22.02	21.49	18.05	17.38
snx-01	36.95	23.28	30.07	21.21
SPECviewperf 10.0 (HP xw6600)				
3dsmax-04	58.46	58.38	58.42	58.38
catia-02	57.90	57.82	57.09	57.81
ensight-03	N/A	66.27	N/A	59.12
maya-02	307.28	265.98	290.12	238.60
proe-04	45.88	45.70	45.87	45.90
sw-01	85.71	85.40	85.33	84.46
tcvis-01	45.34	44.35	39.59	36.86
ugnx-01	81.94	69.38	63.52	64.41
SPECIFICATIONS				
Bus architecture	PCI Express X16	PCI Express X16	PCI Express X16	PCI Express X16
Extra power req-d	Yes	Yes	No	No
Form factor	4.38"x11.00"	4.38"x11.00"	4.38"x9.00"	4.38"x9.00"
Slots used	1	1	1	1
Max Power (watts)	150W	138W	75W	74W
PCIe version	2.0	2.0	2.0	2.0
Length	full-length	full-length	full-length	full-length
Processors	1280	1440	512	800
Memory configuration	2GB (GDDR5)	2GB (DDR5)	2GB (GDDR5)	1GB (GDDR5)
Memory interface	256-bit	128-bit	256-bit	128-bit
Memory bandwidth	160.0 GB/sec	128.0 GB/sec	64.0 GB/sec	64.0 GB/sec
Number of Dual-Link DVI Outputs	0	1	1	1
Number of Display Port Outputs	4	2	2	2
	Yes (2)	No	No	No
Stereo 3D Connector (3-pin)	()			No
· · · /	Yes (1)	Yes (1)	No	No
Framelock/Genlock		Yes (1)	No Yes	Yes
Framelock/Genlock AMD Crossfire Pro	Yes (1)			
Stereo 3D Connector (3-pin) Framelock/Genlock AMD Crossfire Pro OpenGL version DirectX/Shader Model	Yes (1) Yes	Yes	Yes	Yes

<sup>1.</sup> Requires optional Synchronization module. 2. With included expansion bracket.

#### PRICE/PERFORMANCE OF SELECT AMD AND NVIDIA BOARDS



station running the 64-bit version of Windows 7.

Based on our results, the newest AMD FirePro boards surpass the performance of the older boards, with the new mid-range V5900 actually outpacing the older highend V7800. Because we had just finished testing the comparable NVIDIA boards, we included the Quadro 2000 and Quadro 4000 in our Price/Performance chart. In the highly competitive mid-range, the new FirePro V5900 delivered better graphics performance at a similar price point, while the FirePro V7900 lagged just slightly behind the Quadro 4000 on the SPEC Viewperf test.

The new AMD FirePro boards are fully certified with most CAD and DCC applications, and all of the boards in the FirePro line, including earlier ATI-branded boards, use the same unified video driver. Drivers are available for most 32- and 64-bit operating systems, including Windows 7, Vista, XP and Linux.

AMD continues to sell the previous-generation FirePro Vx800-series boards, so customers have lots of choices at every price point. AMD has also gained some

market share over the past year, so expect competition with rival NVIDIA to heat up in the months to come. **DE** 

**David Cohn** is the technical publishing manager at 4D Technologies. He's a contributing editor to Desktop Engineering and also does consulting and technical writing from his home in Bellingham, WA. The author of more than a dozen books has been benchmarking PCs since 1984. You can contact him via email at david@dscohn.com or visit DSCohn.com.

**INFO** → **AMD**: AMD.com

→ SPECviewperf: SPEC.org

AMD Fire Pro V5900

Price: \$599 (suggested retail), \$459 (average street)

**AMD Fire Pro V7900** 

**Price:** \$999 (suggested retail), \$759 (average street) For more information on this topic, visit deskeng.com.

# The Role of CFD in Product Development

A new Aberdeen study finds that computational fluid dynamics are helping companies keep quality up and costs down.

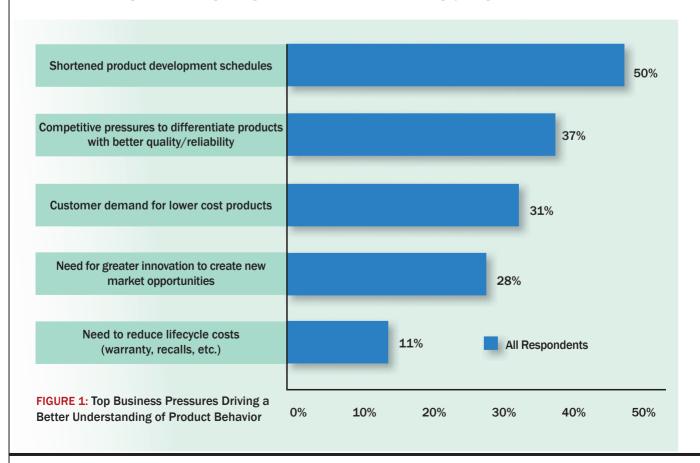
#### BY MICHELLE BOUCHER

revious research from the Aberdeen Group (the November 2008 *Engineering Evolved* study) found that those leveraging three or more different types of simulations are able to reduce the number of physical prototypes by 37%. For complex products, this reduction in physical prototypes leads to cost reductions of up to \$332,673 — and removes 118 days from the development process.

To explore this further, in a study released this spring, Getting Product Design Right the First Time with CFD, Aberdeen investigated the impact of computational fluid dynamics (CFD) on the product development process. For this

research, those who developed products that would most benefit from CFD were isolated and their practices examined. These companies were identified as those whose products were affected by:

- air/gas flow
- fluid flow
- heating/cooling
- · chemical reactions/combustion
- turbulence
- other related physical phenomena



#### **Understanding Product Behavior**

To understand the external factors driving companies to better understand product behavior during the development process, survey respondents whose products are affected by air or flow or other related physical phenomena were asked to pick their Top two external pressures. The top pressures are time and quality, followed by cost (see Figure 1 on previous page).

Time-to-market pressure is driving shortened development schedules, and thus is the top pressure for product development. What is interesting about this is that findings from just last year (Cost Saving Strategies for Engineering: Using Simulation to Make Better Decisions, April 2010) found that cost was the top driving pressure while time came in second. This shift demonstrates that time is always an important pressure, but cost becomes even more important in a down economy. Suffice it to say, an improving business environment permits engineering efforts to focus on providing fresh and improved products to customers to fuel the organic growth companies want.

For some insight into how CFD helps address these market pressures, those using CFD were asked what the two biggest impacts would be if CFD were not used. The results are seen in Figure 2.

By using CFD, a variety of conditions can be tested without incurring the cost — or time delays — of building a physical prototype. When problems are found, CFD results can be used to better understand how the failure occurs, which makes arriving at a solution that much faster. Because more can be done in the virtual environment, it is easier to evaluate many design iterations to arrive at a cost-effective solution that will meet performance and quality criteria.

In addition, because more iterations can be evaluated, there are more opportunities to evaluate new innovations. Finally, because so much of the design can be validated virtually, physical test time does not need to be wasted on simple verification, but can instead focus on higher level testing. The end result of all of this is time is saved, quality goes up, and cost is lowered.

What is especially interesting is that 97% of respondents using CFD find value in it. Clearly, when products are affected by air or fluid flow or other related physical phenomena, CFD is a very important technology. However, what CFD software functions are the most useful? Those using CFD were asked this question — and the top five most useful functions can be found in Table 1. Respondents using CFD ranked each function on a scale of 1 to 5, with 1 being the least useful and 5 being the most.



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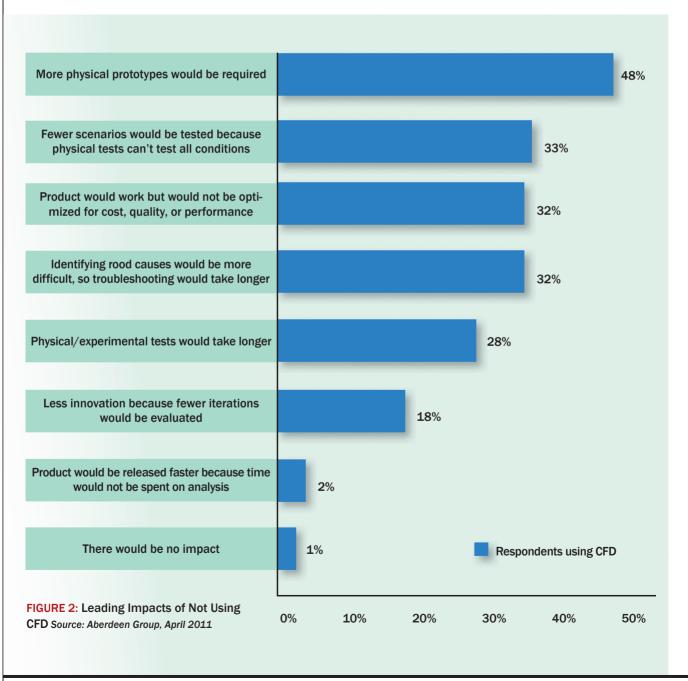
# Simulation & Analysis /// Computational Fluid Dynamics

The many types of different analyses that are possible with CFD were rated very useful, with pressure drop and temperature distribution being rated the most useful. The usefulness of each function will vary depending on product function, but these results show that pressure drop is widely applicable — and users find it to have a large impact on the performance of their products.

In addition, Aberdeen asked respondents who use CFD what were the most useful simulation technologies (see Table 2). The ability to automatically mesh the model, followed by the ability to tweak that mesh, was

rated as extremely useful. Automatic meshing saves setup time. While this is useful, more experienced users often want the flexibility to make tweaks to that mesh to either change the type of the mesh, or perhaps use a finer mesh in more critical areas and a looser mesh in areas that are less important to reduce processing time.

The ability to distribute simulation processing across multiple computers or in a cloud is also rated to be useful. As more companies adopt cloud-computing technologies, the usefulness of this capability is likely to increase, as it relieves desktop computers of the computational intensity of the simulation so that other



Rank	CFD Functions	Score
1	Pressure drop	4.51
2	Temperature distribution	3.47
3	Aerodynamic lift or drag	3.29
4	Fluid mixing rates	3.13
5	Chemical concentrations	3.20

**TABLE 1**: Top 5 Most Useful CFD Functions for the Best in Class, ranked on a scale of 1 to 5.

Source: Aberdeen Group, April 2011

Rank	CFD Functions	Score
1	Automatic meshing	3.35
2	Mesh style flexibility	3.29
3	Ability to integrate simulation and design	3.25
4	Automation of CAD model set-up/simplification	3.18
5	Ability to distribute processing across multiple computers/use cloud	3.08

**TABLE 2**: Top 5 Most Useful Simulation Technologies to CFD Users, ranked on a scale of 1 to 5.

Source: Aberdeen Group, April 2011

work can be done. With more computation power to process the simulation, it also reduces the time needed to arrive at results.

#### **Key Takeaways**

Those using CFD find it adds a lot of value to the development process. The complexity of today's products makes it difficult to predict product behavior without supporting tools to help them obtain better insight into how that product will perform in a real-world environment. CFD helps them do just that — and as a result, they are better positioned to meet the top business pressures of bringing new products to market as quickly as possible, with a high level of quality, while keeping costs down. **DE** 

Michelle Boucher is a research analyst in the Product Innovation and Engineering practice at Aberdeen Group, where she focuses on identifying product development best practices. She has published more than 50 studies on the use of CAD, CAE, PLM and other topics, including manufacturing planning, systems engineering and mass customization.

INFO → Aberdeen Group: Aberdeen.com

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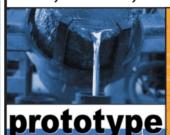
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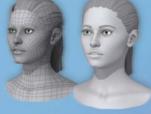
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# **Strong Engineering Outlook**

Recent reports indicate some reasons for optimism in the manufacturing sector.

The Advanced Manufacturing Partnership, recently announced by the Obama Administration, is a national effort to bring industry, universities and the federal government together to invest in emerging technologies that create manufacturing jobs and boost global competitiveness, particularly in industries critical to national security. The \$500 million plan uses existing funds and future appropriations from various federal agencies to boost innovation in manufacturing technologies such as small, high-powered batteries, advanced composites, metal fabrication, biomanufacturing and alternative engineering. The goal is to enhance defense-critical industries; build U.S. leadership in next-generation robotics; increase energy efficiency in manufacturing; and develop technologies to help improve manufacturing efficiency.

Douglas K. Woods, president of AMT — The Association For Manufacturing Technology — says he greets the news with optimism that the U.S. government is realizing the role manufacturing technology plays in national security and sustained economic growth.

"Collaboration is key to speeding the development of nextgeneration manufacturing technologies and products, as well as building a manufacturing smartforce," Woods says. "Leveraging existing funds to jumpstart this effort is a big plus given the current deficit. However, as Congress grapples with the debt ceiling and budget this summer, it must consider that investments in science, technology and smartforce made today will increase revenue in the long run."

In related news, the results of ThomasNet's most recent Industry Market Barometer (IMB) report shows industrial companies are confidently investing in their businesses to build upon a period of sustained growth.

Nearly half (45%) of the companies responding report growth over the last six months of 2010, and the majority (88%) are confident in their future expansion. The survey says a set of specific strategies fueled this growth, from customer retention efforts to movement into new markets and product development. Bolstered by the results of these strategies, respondents are investing more in their companies and recruiting talent in anticipation of increased customer demand.

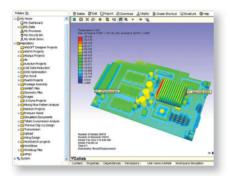
"Industrial buyers and sellers are busy collaborating in a way that is feeding and sustaining the sector's growth, which bodes well for the overall economy," says Eileen Markowitz, president, Thomas Industrial Network. "Successful companies are executing strategies that cultivate existing customer relationships and develop new business opportunities. Our data also shows that they're relying heavily on the Internet to improve the effectiveness of these strategies." DE

# **Editor's Picks**



#### by Anthony J. Lockwood

Each week, Tony Lockwood combs through dozens of new products to bring you the ones he thinks will help you do your job better, smarter and faster. Here are some of Lockwood's recent musings about the products that have really grabbed his attention.



#### **ANSYS Releases Engineering Knowledge Manager 13.0**

Simulation process and data management software updated with new features.

Now out in version 13.0, ANSYS Engineering Knowledge Manager is, of course, tightly integrated with other ANSYS simulation offerings; however, the company says that it can be "very easily" integrated with other legacy and commercial simulation software. That's good since what it does is enable you to leverage a centralized repository to store and manage

simulation data and processes. It automatically extracts meta data from simulation data, which means you can find, review, and retrieve simulation data using keywords or searches across a single or multiple targets.

But ANSYS EKM13.0 is more than just a tool for neatly organizing CAE data.

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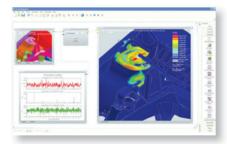
#### AMD Releases FirePro 2270 and ATI FirePro V5800 DVI

New AMD professional graphics solutions enhance visual display capabilities.

Often, you don't leverage dual monitors because your graphics card just doesn't have the horsepower to run a pair of graphicsintensive applications on both screens simultaneously. Or, if it can, it's a struggle. And your boss has zero inclination to expense the bucks for an ultra high-end workstation that could solve some of your issues. So, your productivity suffers, driving up those hidden costs CFOs fret about.

The possibility of a solution to that all too common scenario is what intrigued me about AMD's recent announcement of a pair of new graphics cards, the AMD FirePro 2270 and ATI FirePro V5800 DVI.

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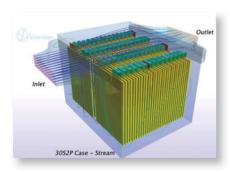


#### **CAE Software's Weld Fatigue Prediction Improved**

nCode DesignLife offers safety calculations for thin sheet component manufacturing.

Michigan-based HBM nCode was once called nCode International. It was renamed after being acquired by test and measurement specialist HBM GmbH, a German subsidiary of the British precision instrumentation and control manufacturer Spectris. HBM nCode's expertise is in services and products for durability engineering, signal processing, data acquisition, data management, and operational monitoring and prognostics. So, with a pedigree running from DA through CAE, news that the company announced version 7 of its nCode DesignLife fatigue analysis software caught my eye.

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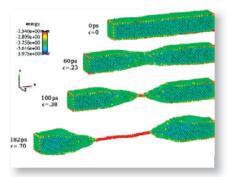
#### CD-adapco Releases STAR-CCM+ v6.02

Multiphysics engineering simulation tool adds more functionality.

STAR-CCM+ is CD-adapco's flagship simulation tool. Tool sounds so blasé. STAR-CCM+ is really more of both a single-interface trove of physics simulation technologies and a integrated hub for your physics simulation work. By hub, I mean two things. First, it plays well with thirdparty CAE software — you can import/export data to other applications and you can even

execute co-simulations. Second, STAR-CCM+ is noted for its time- and effort-saving geometry creation and preparation tools. Its CATIA V5, SolidWorks, Creo Elements/Pro, and NX CAD clients offer full parametric associativity, boundary setup, and polyhedral as well as trimmed cell meshing.

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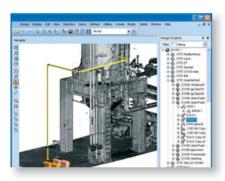
#### **EnSight 9.2 for Engineering Visualization Released**

Software features HPC launch, faster rendering, and a direct OpenFOAM reader.

CEI (Computational Engineering International) has released version 9.2 of its EnSight family of visualization and post-processing tools. CEI has been developing what it calls "extreme visualization" software since I don't know when — at least 1999. The products this company develops come in versions intended to make high-quality

graphics and rendering of engineering models accessible for organizations large and small with needs great or modest. EnSight works with most major CAD and CAE systems and data formats, and there's even a version optimized for the complexities of CFD results.

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#### **Solutions Streamline Plant Upgrade and Revamp Projects**

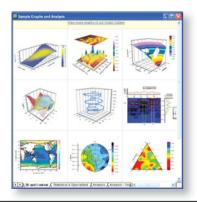
AVEVA optimizes laser scanning operations for industrial plant facilities.

AVEVA Solutions, a provider of engineering IT software for the plant, power, and marine industries, recently unveiled a couple of laser-scanning processing tools that enable you to produce intelligent 3D models of an industrial site cost- and time-effectively.

The first is called AVEVA IntelliLaser. Now, what this does is enable industrial process

plant operators to add intelligence to dumb photorealistic laser-scan data with minimal manual work. Next there's AVEVA Laser Modeller — the double L there reflecting the company's British roots. With this software, you can position a plant model within an accurate model of its planned site.

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#### **Graphing and Data Analysis System Upgraded**

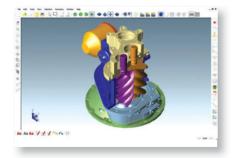
New Gadgets and graph reconstruction tool highlight OriginLab release.

Data is to an engineer or scientist as clay to a sculptor: a lump of potential. Sculpting—that is processing—your data to coax out information that leads to discovery and understanding is what separates the hacks from pros. This is why well-crafted software systems for data analysis are critical for good engineering. And this is why I took notice of the newest

releases of the Origin engineering scientific data analysis systems from OriginLab.

Origin is software for data analysis, publication-quality graphing, and programming with expertise in such areas as peak analysis, curve fitting, statistics, image analysis, and signal processing.

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#### **Software Offers Enhanced CATIA V5 Metadata Support**

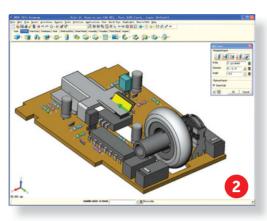
TransMagic also supports NX, Creo Elements/Pro, SolidWorks and Parasolid.

The people at TransMagic released a service pack upgrade of their TransMagic CAD/CAM/CAE data exchange applications. The idea here is simple: TransMagic tries to make the job of getting a file from one incompatible format to another as painless as possible. Recognizing the mathematical impossibility of perfection, it comes with a set of geometry repair tools.

This release grabbed my interest for a number of reasons, chief of which is that it caught up with the latest developments in the world of CAD applications and modeling kernels. And that's like winning at Whack a Mole because CAD/CAM/CAE developers constantly change and extend their software.

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#### **Objet Releases Objet260** L Connex 3D Printer

Objet Ltd. (objet.com) has announced the Objet260 Connex, a compact addition to the company's family of multi-material 3D printers. The Objet260 Connex is based on the company's inkjet 3D printing technology, which is able to jet two materials at the same time. Objet's technology allows users to select from a range of composite materials when building 3D models, such as the company's recently released ABS-like material.

#### **Dassault Systèmes Introduces V5R21 PLM Software**

Dassault Systèmes (3ds.com) has announced the availability of Version 5 Release 21 (V5R21) PLM software. The company says V5R21 solutions establish "digital continuity" from engineering to real shopfloor manufacturing operations to support customer needs, while leveraging Version 6 technologies for better co-existence of V5 and V6 solutions in customer environments. In V5R21, Dassault Systèmes delivers upward and downward compatibility between CATIA V5

and V6 data that is equivalent to the compatibility between two releases of V5.

#### Zuken Releases E3.series 2011

Zuken (zuken.com) has announced the latest version of its electrical CAD software E3.series. The company says the new version includes time-saving shortcuts and new functionality. The E3. Functional Design tool has been developed to make the up-front sketchpad-type planning phase faster. The functional blocks are now dynamic, enabling a user to create blocks on the fly that can be updated with a complete library part later in the design process. Rather than needing a library item to be defined, the designer can sketch out the design and come back to add the details later.

#### ZWSOFT Updates ZWCAD 2011

ZWSOFT (zwsoft.com) has released ZWCAD 2011.6.30, which it says provides engineers with a cost-effective CAD solution for the entire workflow. The update for ZWCAD 2011 offers the following enhancements, according to the company: An improved file compare now

compares changes to block entities, block attributes, font styles, and dimension attributes; a new selection preview system; improved snap; greater stability; and optimized APIs (application programming interfaces).

#### **Geometric Releases** NestLib 2011 R2

Geometric Limited (geometricglobal.com) has announced the release of NestLib 2011 R2 with improvements in the grid nesting algorithm and new features. Highlights of NestLib 2011 R2 include material saving using the improved grid algorithm, multi-tool support for cutting different edges in a part, and the capability to handle piercing data attached to a part while nesting.

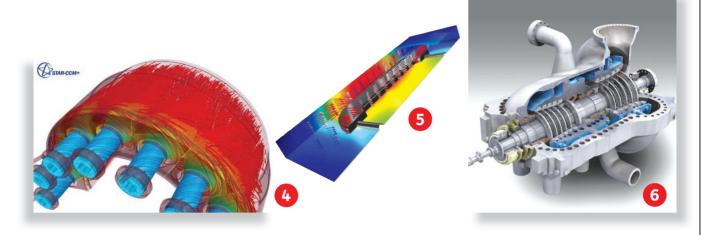
#### 🔁 Autodesk Vault Works with Microsoft SharePoint

Autodesk, Inc. (autodesk.com) has announced that Autodesk Vault 2012 software now works with Microsoft SharePoint 2010 and Microsoft SQL Server 2008 R2 (microsoft.com) to facilitate access to design information across the enterprise.

Autodesk's data management software works with the Microsoft collaboration platform to simplify business intelligence, content management, and search and sharing functions for intranet and Internet sites. SharePoint 2010 users now have direct access to building information modeling (BIM) and digital prototyping data within Vault.

#### **Open Design Alliance Announces Teigha Version 3.5**

Open Design Alliance (opendesign.com) has announced the release of version 3.5 of Teigha, its software development platform for engineering applications. Version 3.5 incorporates performance enhancements and a number of bug fixes donated to ODA by its members, as well as improvements made by the ODA development team. The update includes the following enhancements, according to ODA: Improved raster image support through the incorporation of the FreeImage raster library, and Teigha for .dgn files, which adds support for entity selection and drawing order.



#### Altair Releases HyperWorks 11.0

Altair Engineering, Inc. (altair.com) has announced the release of HyperWorks 11.0, the latest version of its computer-aided engineering (CAE) software suite. Highlights of HyperWorks 11.0 include the addition of two new software products to the HyperWorks suite: AcuSolve and solidThinking. AcuSolve is a computational fluid dynamics (CFD) flow and multi-physics solver, and solidThinking is a 3D conceptual modeling and visualization software package. It also offers an extended breadth of solver solutions in RADIOSS, allowing engineers to address complex design challenges.

### OMEGA Introduces Infrared Thermometer

Omega's (omega.com) new handheld OS1327D series of infrared thermometers feature a non-contact temperature measurement instrument. It features adjustable emissivity, laser sighting, backlit LCD, 12:1 field of view, max/min/avg/diff temperature monitoring, high/low audible alarms,

temperature and storage data. Prices start at \$189.

# STAR-CD and es-ice v4.16 Simulation Toolkit

CD-adapco's

(cd-adapco.com) STAR-CD is designed to increase the potential for innovation through the addition and improvement of physical modeling capabilities, and reduce the time and cost of simulation with the introduction of new automation capabilities. Physical modeling capabilities have been enhanced to provide further improvement, and new options and capabilities for the G-equation combustion model; a new active mode option is included for DARS-Knock for both ECFM-3Z and G-Equation; and further validation and consolidation of other existing ICE related spray, combustion and emission models have been made.

# OpenCFD Releases OpenFOAM Version 2.0.0 OpenCFD

(opendesign.com) has announced the release of version 2.0.0 of its OpenFOAM open-source CFD toolbox. Version 2.0.0 is distributed as Debian packs created for Ubuntu, RPM packs created for SuSE (to be released shortly) and as source code for compilation on other Linux systems.

# Electrodeposition Module Released by COMSOL

COMSOL, Inc. (comsol.com) has announced the release of the Electrodeposition Module, a new add-on expansion module for the company's flagship product, COMSOL Multiphysics. The Electrodeposition Module provides engineers with the ability to model and simulate the shape and composition of electrodeposits for such processes as copper and gold electroplating in the electronics industry, wear and corrosion-protective coatings of mechanical parts, decorative coatings such as chrome and nickel plating of automotive parts, as well as electroforming of thin and complex manufactured parts. The Electrodeposition Module enables simulations for investigating the influence of cell and electrode geometry, chemistry, material properties, and operating conditions.

## Caedium Bursts CFD to the Cloud

In collaboration with Microsoft (microsoft.com), Symscape (symscape.com) has developed a "burst to Windows Azure" capability for the next release of Caedium (v3) running on Windows HPC Server 2008 R2 SP1. The new feature is designed to allow Caedium users to better optimize their designs by performing more CFD simulations unbounded by on-premise hardware limitations, thanks to the elastic resource scaling of the cloudbased Azure service.

#### 6 Siemens PLM Software Releases Solid Edge ST4

Siemens PLM Software (siemens.com/plm/st4) has released Solid Edge ST4, the newest version of its mechanical CAD system. The company says that this latest release offers enhancements to synchronous technology, improved multi-CAD collaboration using the JT data format, new tools to speed up sheet metal design validation, and further refinements to its drafting capability. New tools in Solid Edge ST4 include an automated "live sections" capability that helps users create and edit revolved parts more easily and quickly. New 3D modeling relationships facilitate the centering, offsetting, and editing of native or imported geometry, and 3D assembly relationships automatically position parts in an assembly to avoid part interference.

### Contex Launches Wide Format Scanning Solutions

Contex (contex.com) has announced a wide format scanning solution for the electronic document/content management market that features EMC Captiva ISIS drivers. With this standard interface, users can eliminate workflow processing bottlenecks in scanning large format drawings, charts, maps, or other over-sized documents directly into EDM or ECM systems such as Documentum, LaserFiche,

and PaperVision. Contex's EDM/ECM large format scanning solutions include the XD and SD series, which scan up to 24- and 44-in., respectively. These series of scanners directly interface with electronic capture software such as QuickScan Pro and Kodak Capture Pro for managing large format documents within the same workflow process as letter- or legal-size documents.

# Canon imageFORMULA scanners available via Océ

Océ (oceusa.com) has announced that Océ North America Document Printing Systems has begun selling Canon's imageFORMULA document scanners. The image-FORMULA scanner products feature 17 models that scan from up to 15 pages-per-minute to up to 130 ppm (letter), and can scan in color, black and white and grayscale.

### Konica Minolta Launches KIP 700m Printer

Konica Minolta (konicaminolta.com) has released a new large format multifunctional printer, the KIP 700m. It offers up to A0-size document scanning, copying and printing in monochrome. The printer can also be upgraded with color scan, copy and print options. With a footprint of less than a square meter,

the Konica Minolta KIP 700m offers 600 x 600 dpi resolution for printing, copying and scanning. It can be upgraded to a fully featured monochrome printing system. Using the KIP 700m's touchscreen operating panel, documents can also be printed from removable media such as standard USB drives, ensuring document mobility and document security. **DE** 



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# Preparing for Take-off

BY ANDY CORDIAL

hen you board an airplane, you're asked to buckle your seat belt and listen to an important safety announcement. The same is true before you propel your data down the runway and jet it into the cloud.

So, what's in our safety demonstration?

#### **Pack Carefully**

If you've flown before, you'll know that there is limited space in the cabin—with the majority of your luggage having to travel in the hold. Therefore, when you pack, you make sure your most valuable items are squeezed into your carry-on bag. For data, it's not very different.

Before packing all your data off into the cloud, you need to sort it and, for most organizations, not all of it will be suitable to store in the "hold." If the data contains sensitive information that, if compromised, could damage your organization, then you need to consider whether it should be part of the cloud computing data.

# The cloud isn't suitable for everything, or everyone.

#### **Prepare for Passport Control**

Sticking with our aviation theme, after you check your luggage, you have to pass through stringent security checks and have your passport examined. Legitimate travelers will have the correct documentation and be allowed access. In an ideal world, those who don't are identified and prevented access before they can cause any damage.

Assuming you've decided to store your data in the cloud, you need to make sure your passport controls are just as effective. If they're too stringent or time-consuming, legitimate users may not be allowed access; if they're too lax, anyone can get in and violate the data.

Providing flexible access may mean your users will want to use personal devices from outside the corporate environment. This can open a whole can of worms, because the device may be infected with key loggers or other malware that could jeopardize the data or application's security.

If data is password-protected in the real world, then in the virtual one it needs even stronger defenses. The question has to be asked whether cloud security offers this and, if it can't be guaranteed, then serious doubts must remain over its suitability.

Another element is download speed. While bandwidth should not be the only consideration when selecting a cloud service provider, it is an important factor. It needs to be balanced with quality of support, pricing, features and reliability.

#### Fasten Your Seatbelt ...

Personally, I always wonder just how effective an airplane seatbelt is—but, luckily, I've never been on a plane when it has experienced violent turbulence, so I haven't found out. Could the same be true for cloud seatbelts?

New encryption software is creeping into the market designed to protect data stored in the cloud. With AES 256-bit encryption accepted as the most secure option in the real world, I wouldn't recommend anything less even be considered for virtual storage.

Until we really know how insecure these storage facilities can be in the first place, we have no solid idea as to whether these solutions are necessary—or will even work in the event of a breach. That said, admittedly I still fasten my seatbelt when the pilot switches on the sign, and recommend that you do the same for your data. If you're in any doubt about whether you can risk your data falling from the sky, perhaps it shouldn't be there in the first place.

IT analyst Gartner advises businesses that they must work closely with their cloud computing services providers to ensure that potential security issues are flagged, and dealt with, before they become a problem. Don't be blinded by promises of performance or cost savings; a security breach could quickly eradicate both of these benefits and potentially deal a fatal blow to your organization.

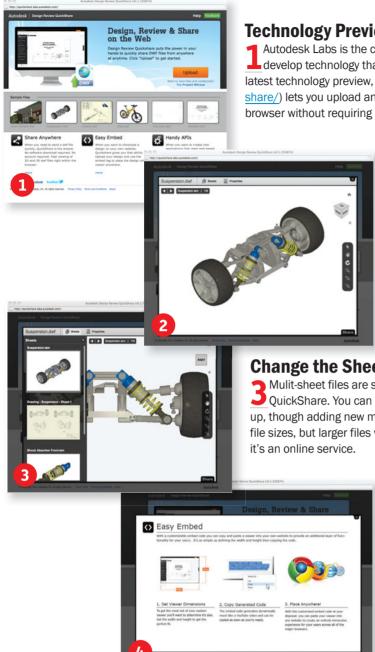
One final consideration is to make sure you've got an escape route planned. How will you reclaim your data? Are you locked in for a given period? Will they help you transfer to another provider?

We've all experienced the vacation of a lifetime that doesn't quite live up to its billing. The climate that's either too hot or too cold, or half the items you've crammed into your suitcase aren't needed, yet your cell phone recharger has somehow been left behind. The cloud is exactly the same: It isn't suitable for everything, or everyone. Careful consideration and planning needs to be undertaken first if you're to migrate the right applications and data to benefit from increased efficiencies and lowered costs. **DE** 

**Andy Cordial** is managing director of Origin Storage Ltd. Contact him via originstorage.com.

# **Cool Tools**

#### Autodesk's Project QuickShare



#### **Technology Preview**

Autodesk Labs is the company's technology incubator created to explore and develop technology that is commercially relevant to customers in design. It's latest technology preview, Project QuickShare (labs.autodesk.com/utilities/quickshare/) lets you upload and share 2D and 3D DWF files for free via a modern browser without requiring an account.

#### **A New View**

2 Both 2D and 3D DWF and DWFx files can be uploaded, rotated and panned in the browserbased viewer. Autodesk has placed a number of sample files in Project QuickShare that you can open and get a feel for the tool before uploading your own files.

#### **Change the Sheets**

Mulit-sheet files are supported and can be navigated via Project QuickShare. You can also examine properties, hide layers, or review markup, though adding new mark-up is not supported. There are no restrictions to file sizes, but larger files will take longer to upload and prepare for viewing since

#### **TECH SPECS**

#### **Project QuickShare Technology Preview**

- Firefox 4.0 and Higher
- Google Chrome
- Internet Explorer 9 and Higher
- Safari 5 and Higher

#### **Share Your File**

Uploaded files can be placed on websites via an embed code that places the viewer and its functionality on any site. You can customize the size of the viewer before generating the embed code. The file also can be shared via a link that will open the file in the Project QuickShare Viewer.

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