Rock-Solid Innovation.

See page 8 for more information.





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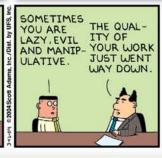












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Forecast: A 100% Chance of Cloud Collaboration

ecently I was watching an interview on a television news show with a young entrepreneur. The future tycoon being interviewed was just out of college, from California, and had set up a company that designed and sold consumer electronic products. His parents were from India. He was a first-generation American citizen.

The designs of his products took place in California, the manufacturing took place in India, and he had a marketing agency in Belgium. Sales of his products had started in the United States, but he was planning on a global sales channel in a short timeframe. The interviewer asked this up-and-coming business owner where his office was located. The young man pulled out a iPhone. "This is my home office," he said.

Engineers will see new ways of working emerge ...

New Ways to Work

In this issue, we are covering how engineers are being freed from their desktop, both figuratively and literally. Technology is enabling them to collaborate and use compute power that only a few years ago could only be found in places like Los Alamos. As applications move to cloud computing and the accessibility of computer cores becomes virtually infinite, engineers will see new ways of working emerge. Some will be good, and some not so good.

When outsourcing fully hit America's technology industries with the new millennium, we experienced both positive and negative effects. Crowdsourcing is now moving into the engineering world. While making a few hundred dollars on a crowdsourced T-shirt design might excite an amateur artist, using crowdsourcing in engineering design could drive innovation and produce better designs.

Crowdsourcing is like putting a design out to bid, and anyone interested can submit an initial design. Design ideas can be discussed, and potential customers can vote on the designs they like and explain why they like them. The successful designers get paid, and the other designers don't.

Crowd Control Needed

For crowdsourcing to work in engineering, the crowd will

have to be limited most of the time. We'll need crowd control. Don't laugh. We all know what happens when collaboration becomes disruptive. It's kind of like The Ladders commercial "When Everyone Plays, Nobody Wins" (youtube.com/watch?v=31ZevWuxnE).

The other potential problem is for the alchemists of the team. You know, your co-workers who don't share knowledge: the ones who turn lead into gold. Crowdsourcing will put fear into their eyes.

Meanwhile, the storage and computing power of the cloud provides a way for engineers to share designs — whether in small, finite groups, or with the whole world. 3D models can be viewed, rotated, and altered. Reuse of designs will be more trustworthy and accepted. PLM will work in ways that we never imagined.

Just the Beginning

Running a business on a smart phone is not inconceivable today, but creating a full-blown 3D CAD model from your Android or iOS phone is not going to happen anytime soon. Most engineering work for the foreseeable future will take place locally, with cloud computing resources used to access engineering data and run applications that use multicore to great advantage, such as simulations, analyses, visualization and rendering.

Still, most of us work remotely, even if we don't think about it. We work from home occasionally and travel moderately. Accessing our data and running cloud applications have become easier and easier. It's also become safer, and in some instances faster. Remember the initial speeds of virtual private networks?

If there is one thing we all know when it comes to technology, what we see now and where we expect technology to be in the future is just the tip of the iceberg. In 1995 when the World Wide Web was taking off, did we expect Facebook or Google? In 2000, did we expect Amazon to be the store of the future?

Where will the world of infinite computing take us? Wherever that is, I expect that all the kinks will be worked out and an engineer's toolset will be nothing like it is today. **DE**

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



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MODEL PHYSICAL SYSTEMS

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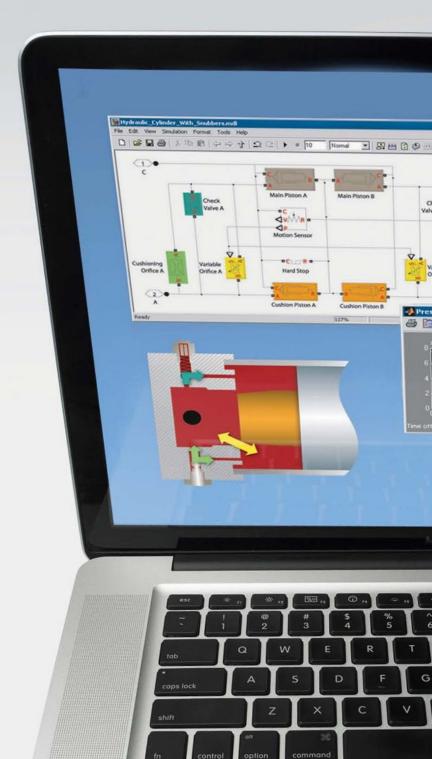
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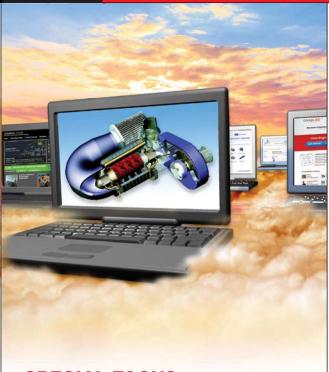
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February 2011 VOLUME 16/ISSUE 6



SPECIAL FOCUS

Collaboration on the Cloud

Engineers are able to collaborate with their co-workers in different departments, thanks to advances in design software that allow complicated designs to be shared. But now collaboration is taking a page from social networking and extending beyond the four walls of the company. What will "social engineering" and crowdsourcing mean to engineers as some firms begin to embrace such openness?

ON THE COVER: Online communities provide a wealth of inspiration, perspective and models that design engineers can use to build better products. (Model image courtesy of DS SolidWorks.)

MCAD

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By Michelle Boucher

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Although it made a big impression, the Digital Storm PROTUS workstation delivers mixed results.

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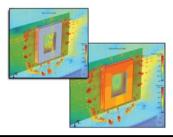
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Online communities and remote computing bring about social engineering changes.

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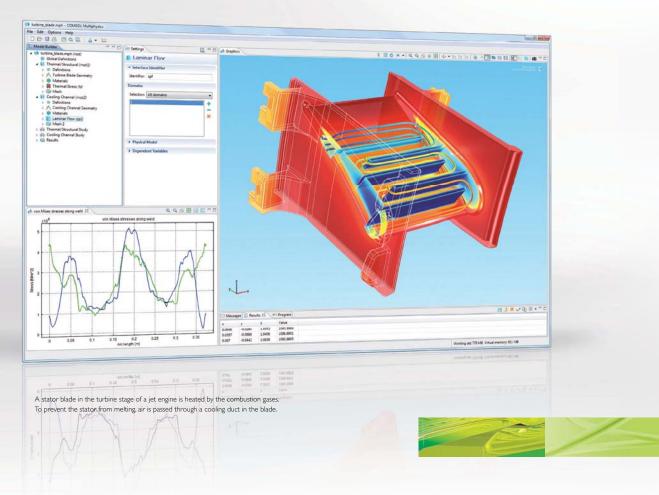
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As today's product design and development issues become more complex, engineers will want to seek expertise beyond company walls.

By Chris Forbes





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Rendering in a Browser with F-BOX

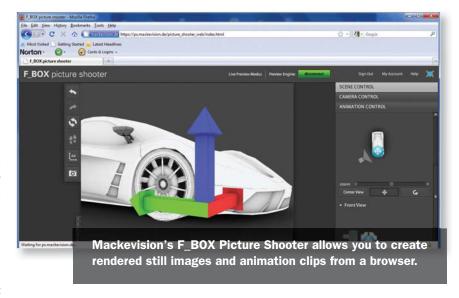
ormally, when we're running a rendering program, we shut down all the rest. As much as we like to multitask, we can't afford to have the CPU's attention divided. We need all of its horsepower—and then some—to calculate the ray bounces in the scene.

But what if you could render on someone else's machine? That's what Mackevision's F BOX Picture Shooter allows. No installation, no download, no client app. All you need is a secure log-in, a password — and the latest version of Flash.

Once you are logged in, you have access to Picture Shooter's simple, intuitive interface. You can move your 3D object in the XYZ axes using directional arrows or rotate it around using a circular arrow. The program comes with some preloaded scenes and back plates, but you can search for more — and even load your own.

Camera controls work the same way. You can grab and move your camera around the object to get instant perspective updates. The ray-trace engine is off by default, but if you'd like to work in a program window with ray-traced objects, you can turn on the engine with a single click. Now, remember, you're using Mackevision's remote server cluster, so your local machine won't become sluggish when you turn on ray-tracing.

Once you're happy with your compo-



sition, go to the Order Picture window to specify the resolution, format and delivery method you'd like. Then you can go back to doing whatever you were doing before on your local machine, whether perfecting an assembly or chatting on Facebook. Your local CPU remains free to take on other tasks.

Picture Shooter is a program primarily targeted at those who need to create high-resolution still images. Nevertheless, it comes with some basic animation functions so you can create, for example, an animated walk-around of a specific 3D model. It doesn't, however, come with a material library.

The application may ideally be used

by manufacturers who need to churn out multiple versions of the same product — for instance, six color variations of the same luxury vehicle model. The account holder may preload the vehicle model with a range of colors possible, then start generating still images using Picture Shooter. The account holder may also provide trusted digital artists with the necessary credentials to generate images. DE

INFO → **Mackevision:** Mackevision.de

→ A video demo is available at:

DEexchange.com

Clip title: F_BOX_PictureShooter.

Match Your Needs to the Right Workstation.

See page 11 for more information.

New modo 501 features Pixar Subdivisions



he difference in modo 401 and modo 501 may be a single digit, but if you upgrade from the former to the latter, you can expect to see an up to 40% increase in rendering speed, according to Luxology. In addition, modo 501 also promises improvements in texture baking, depth of field, bump mapping and fur simulation.

"We've done a lot of research looking into speed gain in CPU vs. GPU. I was hoping to find speed gains in the GPU. We don't find that to be true immediately," notes Brad Peebler, Luxology's CEO, in the video launching the new release.

Many believe a GPU's parallel processing can improve rendering operations. However, R&D in this area is a territory where Luxology must tread carefully; the company has an ongoing partnership with Intel to find ray-tracing optimization methods using the CPU. The speed gain in the current version comes from what Peebler describes as "a massive update to the ray-tracing acceleration structures" in its rendering engine and "memory use [optimization]."

In modo 501, you can paint textures onto your model - similar to applying textures in Autodesk Mudbox or Blender, for example. It's a useful method to add effects, such as rust and oxidation, in your model without additional modeling work.

The new release features Pixar subdi-



An interior scene, rendered in modo 501. Image courtesy of Luxology and Chris Morris

visional surfaces. These are different from modo's standard subdivisional surfaces, and are more effective in applying deformation to edges (called "edge weighting"). This allows you to create a new look in your model without modifying its geometry, modo 501 is available for both PC and Mac. This version marks the introduction of 64-bit Mac OS support. DE

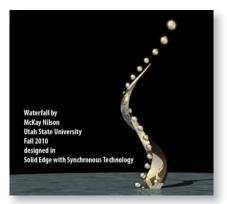
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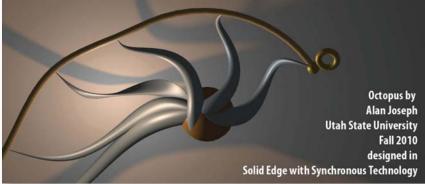
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You Gotta Have Art: Student Designs in Solid Edge with ST





symptom of an uninspired working life: You begin to think inside the box. In design and engineering, if you've been repeatedly told to risk as little as possible, to always conform to a set of aesthetic standards, and to reuse as many pre-existing components as possible, sooner or later you'll lose your creative edge (most likely, sooner).

Many of us think of mechanical CAD packages as tools for designing devices with electromechanical functions. When we begin a project, we already have in mind a rough idea of the standard components we'll be using. We draw inspiration from existing objects, from last season's bestsellers. Naturally, we end up designing variations of the same.

That's why my encounter with the students from Professor John Devitry's class served as a reminder that we should all strive to hold onto the spirit of experimentation. Devitry is an adjunct faculty member of the Mechanical and Aerospace Engineering department at Utah State University. He's also the CAD administrator at the Space Dynamics Lab. Previously, he worked for UGS PLM Solutions (now known as Siemens PLM Software) as the Western U.S. regional lead application engineer.

Devitry didn't bother telling his students what they couldn't do with a mechanical CAD program. Consequently, his students turned out designs that many of us wouldn't even think of attempting in such software.

The work featured here came from Elizabeth Geverman, Alan Joseph and McKay Nilson, all from Devitry's CAD class. They used Solid Edge with Synchronous Technology, but their designs could easily fool untrained eyes into thinking they come from 3ds Max, Maya and Rhino-programs better suited than mechanical CAD for form exploration. They remind us something many seem to have forgotten about design: It needs art.

"Well, art is a big part of engineering," notes Geyerman. "I mean, if something doesn't have aesthetic appeal, no one is going to want to use it or buy it. When I started learning this program [Solid Edge with Synchronous Technology], I thought not only is it practical, it could also be a medium of art."

If you're suffering from idea block, try Joseph's advice: "Go to an art museum ... try and feel the creativity, doodle ... Yes, you can make this assembly or this faucet work, then you can take the outside of that and maybe give it a sort of sculptural look. It's not just a faucet; it's a piece of modern art." DE



INFO Siemens PLM Software:

PLM.automation.siemens.com

INFO → A video demo is available at DEexchange.com.

Clip title: Student Designs in Solid Edge.

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Special Section: Excerpts from DE's 15th Anniversary Podcasts

hroughout December 2010, DE published a series of recorded interviews with industry leaders on the past, present and future. Here is just a sampling. To listen to the interviews in full, visit deskeng.com/virtual_desktop.

"There was great engineering software [in 1995, the year DE launched], but it was very hard to use and it wasn't available to everyone, because it was using hardware and software systems only available to big companies [who can afford] the financial, HR and technical resources to back it up ... Windows really democratized technology and put it in the hands of those who had never had it before.

"We're on the cusp of another platform change with online computing ... It's powerful because it removes barriers we don't even know we have today. We're so used to dealing with the limitations of desktop software that we just take them for granted and treat them like the laws of physics — as immovable as the laws of gravity."

—Jeff Ray, executive vice president, Geographic Operations, SolidWorks

On the cover of DE in 2025, "I predict you'll be featuring hardware that's CAD-specific, some sort of device or display ... You'll look at the picture of a keyboard and a mouse in the way we now look at punch cards ... I think you'll use CAD more in the fashion of the movie Iron Man.

"It's incumbent upon us as an industry to see how we might take advantage of those technologies being pioneered [in media and entertainment], even [in how they use] physical simulation in the video game market.

"[Fifteen years from now,] installed software would seem archaic ... We won't even think of things like backup, upgrades, license code. We'll expect to have information everywhere."

—Jon Hirschtick, co-founder, SolidWorks 5 4 1

"[One of the notable milestones after Kubotek's acquisition of CADKEY] was the direct feature recognition [a forerunner of what would later become direct modeling, history-free modeling and explicit modeling]. This is the ability to look at a model and, instead of trying to remember how it was created or what the original in-

tent was, just focus on the shape itself, and use geometry tools to extract [feature info] so that it's editable."

—John McCullough, product manager, **KeyCreator**

"Six, seven years ago when I started [working with the KeyCreator team], we were all very aware that the main way we were communicating with the customers was a one-way street, and that was through the media: getting articles placed and taking advertisement in the physical [print] magazine. Today, most of our leads—95% of the people looking to learn about our product are coming from the Internet."

—Scott Sweeney, VP of marketing, Kubotek

"I believe it was right around [1995] that we were inventing the terminol-



ogy [for PLM]. In fact, IBM and DS together coined the phrase 'product lifecycle management' ... I think it was a recognition at the time, which we still have, that there was more to envisioning, creating and delivering a product than just CAD.

"We're at another inflection point. The power of the Internet, the ubiquity of access to information that we have." 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 send email to de-editors@deskeng.com.

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Research Reveals **Best Practices**

New study finds how companies with best-in-class multiple CAD environments can thrive.

BY MICHELLE BOUCHER

he reality for today's product development is that very rarely is an entire product designed in only one CAD system. The challenge is bringing together all those CAD models, without losing or recreating work. There simply is no time to waste on fixing imported geometry or recreating work someone else has done.

A new study by the Aberdeen Group, Working with Multi-CAD? Overcome the Engineering Bottleneck, explores how companies can work most effectively with multi-CAD data.

Why the Need for Multi-CAD?

In the study, 82% of respondents report using three or more CAD formats in their design process. Even more surprising, 42% report using five or more. The graph below shows the top pressures driving the need to work with multiple CAD formats.

There are a variety of reasons companies must work with multiple types of CAD data—No. 1 being that product development is not done in isolation. A variety of suppliers, external partners and even customers are all involved.

To collaborate on designs, the CAD data must be shared. And because every company is not necessarily using the same CAD product, a multi-CAD environment is created.

STUDY FINDINGS AT A GLANCE

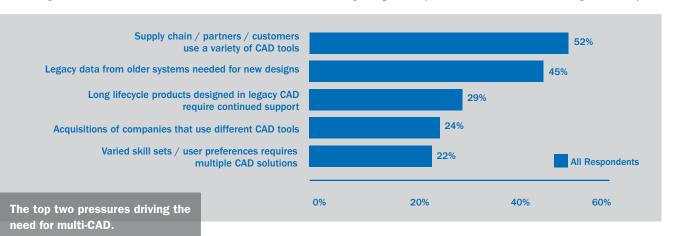
he best-in-class support their multi-CAD environments by standardizing on one CAD application, but making sure they have the ability to deliver and receive in many formats. Interestingly, companies are beginning to rely less on neutral files such as IGES and STEP to support data exchange. Instead, they are relying on visualization tools or direct translations of native CAD files. They are also taking advantage of new CAD functions that help reduce the amount of intelligence lost in CAD files when they are translated into new formats.

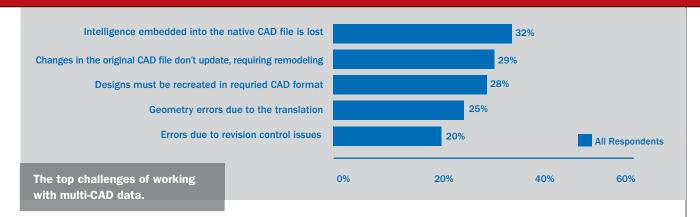
The full Aberdeen study is available online at no cost until Feb. 28, 2011: aberdeen.com/Aberdeen-Library/6752/RA-design-engineering-collaboration.aspx2

The Obstacles of a Multi-CAD Environment

The biggest problem in working with multi-CAD data is that it is not as easy to work with as native CAD. Traditionally, translated geometry behaves as a "dumb" block. So, when engineering change orders (ECOs) come through, manipulating the geometry is very difficult. Often, the easiest thing is to just recreate the geometry, losing any of the time-saving benefits of working from the third-party CAD data in the first place.

Although new CAD technologies have come a long way, CAD data does not always translate cleanly. Engineers are often left with the time-consuming, tedious task of cleaning up the geometry to create a solid model. This process may in-





troduce errors, which result in downstream quality problems.

Finally, when collaborating with third parties and sharing CAD data, as each party makes changes to the design, it is easy for files to get out of synch. Consequently, lack of revision control means risking that work will be done on an outdated version of the CAD model. This results in subsequent errors because of conflicting information from two different versions, which ultimately hurts product quality.

The Downstream Impact

As 3D CAD has become the predominant design tool and CAD technology has advanced, CAD models have become very sophisticated. In fact, as the chart above indicates, losing the intelligence embedded within the native CAD file is the top challenge. One of the reasons why is that CAD files are now used for so much more. See Table 1.

While it is not too surprising that CAD files are used to produce manufacturing information such as assembly instructions and numerical control tool paths, other uses show that CAD has become important to multiple departments. Sales, marketing, documentation and field service all rely on that digital model—and the information embedded in it—to support them in their jobs. With so many departments relying on the digital model, it becomes even more important to be able to work with multi-CAD data.

Deliverable	Respondents
Assembly instructions	90%
Quotation documents (RFPs, RFQs, proposals.)	88%
Customer documentation (owners' manuals)	86%
NC tool paths	80%
Part catalogs	80%
Marketing collateral	74%
Service diagnostic documentation	63%

TABLE 1: The top downstream deliverables using CAD models.

Best Practices

To understand successful approaches for working with multi-CAD data, Aberdeen benchmarked the performance of study participants and categorized them as Best-in-Class (top 20%), Industry Average (mid 50%), or Laggard (bottom 30%).

The top pressure creating a need for multi-CAD environ-

Continued on page 17

Definition of Maturity Class	Mean Class Performance
Best-in-Class Top 20% of aggregate performance scorers	 32% decrease in length of development cycle since implementing current CAD environment 90% of designs released on time 31% decrease in development cost since implementing current CAD environment 91% of designs met quality targets at scheduled design release
Industry Average Middle 50% of aggregate performance scorers	 14% decrease in length of development cycle since implementing current CAD environment 82% of designs released on time 10% decrease in development cost since implementing current CAD environment 83% of designs met quality targets at scheduled design release
Laggard Bottom 30% of aggregate performance scorers	 6% increase in length of develop ment cycle since implementing current CAD environment 67% of designs released on time 5% increase in development cost since implementing current CAD environment 71% of designs met quality targets at scheduled design release

TABLE 2: Advantages of a best-in-class multi-CAD environment.

Work Smarter

Research reveals profitable analytics.

BY MICHELLE BOUCHER

ith pressure to achieve profitable growth, yet fewer resources to achieve that growth, it is critical that companies find ways to work smarter. In a November 2010 Aberdeen study, *Using Product Analytics to Keep Engineering on Schedule and on Budget*, this topic was explored further.

The Business Need for Better Insight

To improve decision-making, it is important to understand what is important to the company in the first place. The figure below shows the top business pressures driving companies to have better insight into decision-making during product development.

The conclusion is clear. Quality, time, and cost are all critical, while at the same time, it is essential that the product requirements that will drive customer demand—and consequently revenue—make it into the final product. To weigh all of these factors, engineers and management must have access to the right information.

What is hardest about collecting this information? Interestingly, it all boils down to one thing: *time*. Engineers are so busy with their day-to-day work that stopping to provide status updates or put together needed metrics is just a distraction, preventing them from getting their design and development work done. In addition, it takes too long to go to all of the individual developers and engineers to obtain the needed information. In fact, those who participated in the Aberdeen study reported spending 18% of their time just providing status updates and preparing for design reviews.

Identifying What Works Best

To understand successful approaches to reduce that time, while still improving decision-making during product devel-

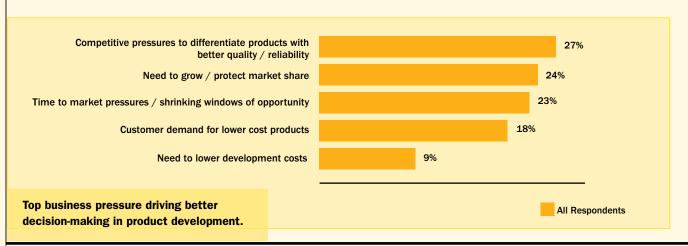
opment and the business impact it has upon companies, Aberdeen conducted a study and benchmarked the performance of participants. Study participants were categorized as either Best-in-Class (top 20% of performers), Industry Average (mid 50%), or Laggard (bottom 30%). Given that the top pressures on product development are about quality, time, cost and revenue, five key performance measures that indicate success with addressing those pressures were used to distinguish the Best-in-Class from Industry Average and Laggard organizations.

One of the top pressures on product development is to lower product cost. The Best-in-Class are successfully doing this by making better decisions to keep product cost down. As a result, they are 39% more likely than the Industry Average to meet product cost targets. In addition, the Best-in-Class have also seen a 7% decrease in their product costs over the last two years. By comparison, the Industry Average saw only a 1% decrease—and the Laggards actually saw an increase in product cost, putting them at a significant competitive disadvantage.

While it is impressive that the Best-in-Class have been able to take cost out, they are not doing this at the expense of quality. They are 23% more likely than the Industry Average to meet quality targets. This means they have visibility to balance what could often be conflicting criteria to arrive at an optimal solution that not only lowers cost, but also meets customer expectations in terms of quality.

Even as the Best-in-Class are able to obtain the needed information to balance cost and quality, they are simultaneously addressing the challenge of time. They are 52% more likely than the Industry Average to release products on time. This means they are collecting the information they need, without adding to development time. They also have the ability to identify bottlenecks in the process, so they can make adjustments as needed so that products are still released on time.

Because the Best-in-Class do such a good job of managing their process, they launch their products on time. This means they optimize their window of opportunity to bring in revenue for the product. Consequently, they are 44% more likely than the Industry Average to meet revenue targets. This also



Continued from page 15

ments is collaboration. A successful multi-CAD environment is one that addresses the need for it, while simultaneously addressing the top challenges. Four key performance measures that indicate success with this were used to distinguish the Best-in-Class from Industry Average and Laggard organizations (see Table 2).

The Best-in-Class are able to leverage work already done by suppliers and partners, or work from customer specifications to save time in their development process. This improves collaboration and allows them to be more efficient. As a result, they reduce their development time by 32%.

In addition, the Best-in-Class release 90% of their designs on time. Showing evidence of their ability to reuse existing CAD data, they are able to reduce development costs by 31%.

Finally, the Best-in-Class do a better job avoiding problems from CAD data translation or poor version control. This is reflected in their ability to meet quality targets when the design is scheduled to be released 90% of the time.

In addition to being more efficient, lowering development costs and achieving higher quality, the Best-in-Class enjoy other benefits, too. Since implementing their current CAD environment, the Best-in-Class participants have been able to reduce the time it takes to translate CAD data by 24%. This contributes to their ability to reduce development time. Their ability to meet quality targets is reflected in a 25% decrease in the number of change orders after design release. They have also done such a good job addressing the challenge of losing the intelligence in the CAD file that they have been able to reduce the time required to implement an ECO by 26%.

The Best-in-Class are 35% more likely than their competitors to standardize on one CAD application. By standardizing on one application, engineers are more efficient because they can perfect their skills in that one application.

In addition, distributing workloads is not limited by CAD skills needed for specific projects. This makes things easier from a management perspective, as there is more flexibility.

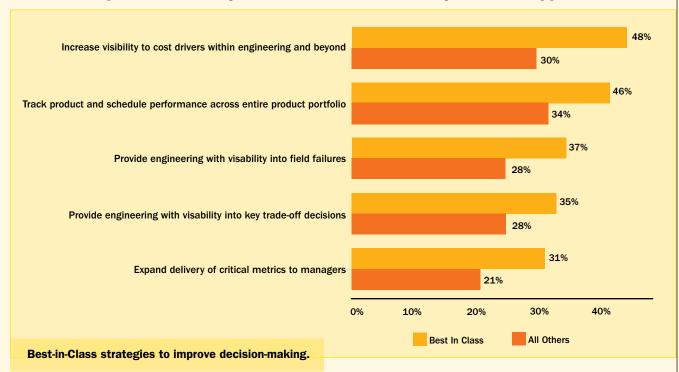
Finally, IT support is simpler because there is only one

means they are successfully implementing the requirements that customers want, which drives demand for the product to bring in the expected revenue.

Best-in-Class Strategies

The strategies followed by the Best-in-Class are very focused on getting the right information to the right people at the right time. This ensures that both engineering and management are more empowered to make the right decisions.

To address the pressure of needing to meet customer expectations for lower-priced products, the Best-in-Class are 60% more likely than their competitors to provide engineering with visibility into cost drivers. Forty-one percent (41%) of survey respondents report that products costing more than budgeted to produce is one of the top issues to have a negative impact on the success of a product. With a better understanding into what will drive up product cost, engineers can make better informed design decisions to keep product cost down.



CAD /// Research

CAD application to support.

When suppliers and customers use a different CAD tool, the Best-in-Class ensure they can deliver and receive files in many formats, even though they only design in one. They are 29% more likely than their competitors to take this approach. As a result, they can focus supplier selection on part quality and cost, rather than their preferred CAD.

One unusual finding from the study is that delivering or receiving CAD files in neutral formats such as IGES or STEP, while still done, is no longer the preferred practice. The Best-in-Class, especially, are more likely to take another approach. This is a shift from Aberdeen's findings in the December 2006 *Multi-CAD Design Chain Benchmark Report*. In 2006, 52% of companies reported delivering designs in neutral formats. This means that, with the advances in available CAD and visualization tools, companies have found better approaches to delivering and receiving CAD data in many formats. **DE**

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They also ensure cross-functional stakeholders have visibility to cost drivers. This enterprise-wide approach to increase visibility to cost means everyone can do their part in contributing to keeping costs in check, which results in a boost in profitability.

The Best-in-Class are able to address time to market pressures by tracking schedule and performance across the entire product portfolio. They can recognize bottlenecks and take corrective action when needed. They also have better insight into how shifts in resources will affect other projects, helping them to better prioritize where efforts should be focused.

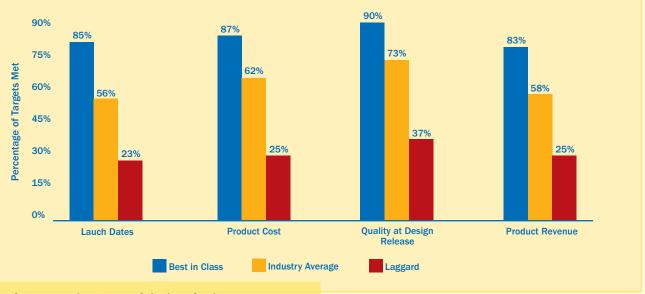
To meet demands for higher quality and reliability, the Bestin-Class are 32% more likely than competitors to provide engineering with visibility to field failures. This helps them learn from previous mistakes so that they can avoid similar failures in the future. They can also incorporate additional scenarios in future test plans to ensure a future failure is not repeated, improving the quality assurance process overall.

Finally, the Best-in-Class ensure management has access to critical information so that they can better manage their teams. To ensure conflicting criteria such as time, cost, quality and per-

formance are balanced, the Best-in-Class are 25% more likely to provide management with visibility into key trade-off decisions. They are also 48% more likely than their competitors to make sure that management has visibility into critical metrics. Not only does this empower them to provide critical oversight to ensure key design criteria and requirements are met, but this also makes it possible to have early visibility into problems such as not meeting regulatory compliance. Early visibility means they can take corrective action and avoid problems that will have a negative business impact, such as stop shipments.

The full Aberdeen study is available at no cost until Feb. 28, 2011 at Aberdeen.com/Aberdeen-Library/6938/RA-product-analytics-engineering.aspx. 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.



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High-Performance Computing /// Review

Size **Doesn't** Matter

After a big impression, the Digital Storm PROTUS delivers mixed results.

BY DAVID COHN

f you've never heard of Digital Storm before, join the club. The company has only been around since 2002, and focused primarily on building gaming systems based on "bleeding-edge technology." But last summer, the Fremont, CA-based company announced a flagship line of workstations custom-built for engineering professionals — and we took Digital Storm up on its offer to run one of the new PROTUS systems through its paces.

We had seen photos of Digital Storm computers, but were still a bit awed when UPS delivered a box measuring $35 \times 31 \times 17$ in. The case, with a high-gloss automotive finish, measured $9 \times 24 \times 24$ in. and tipped the scales at more than 55 lbs. Yet we hardly had to wonder what the case contained, thanks to a 14×16 in. window in the removable left panel.

We also had to open the system immediately before ever turning it on to remove what a label prominently affixed to the outside of the packaging calls "unique and innovative 'StormShield' packaging material." The packaging material turned out to be a bag of expanded foam.

Digital Storm is not really a manufacturer; it's a system integrator, assembling computers from an assortment of components produced by others and readily available from various sources. For example, the huge case is the 800D manufactured by Corsair and available for around \$300. The white Digital Storm paint job added \$139 to the system price.

It's What's Inside that Counts

With such a big chassis, we expected to find all sorts of exotic components. What we found was an assortment of common parts and lots of extra space. The case provides a total of 11 drive bays, five 5.25-in. bays in the upper portion with front panel access, four 3.5-in. SATA hot-swap drive bays behind a hinged door, and two more 3.5-in. internal drive bays located in the bottom-front portion of the case.

A power switch occupies the space above the front panel drive bays, with an adjacent hinged panel that opens to reveal four USB 2.0 ports, an IEEE 1394 (FireWire connector), headphone and microphone jacks with jack detection and jack retasking, and a reset button. Below this, the uppermost two bays were filled with two optical drives made by LG: a Blu-ray writer/reader and a Blu-ray player/DVD writer. The bottommost bay housed a digital media reader, supporting virtually all currently



The Digital Storm PROTUS workstation is an assemblage of readily available components housed in a cavernous chassis. *Image courtesy of David Cohn*

available memory cards, and another USB 2.0 port.

Behind the door, one of the hot-swappable drive bays contained a 160GB Intel solid-state drive. At \$880, this was a relatively expensive choice, but because it hosted the operating system, we expected to see a significant performance improvement. Unfortunately, our results were mixed: boot-up was no faster than other systems equipped with standard hard drives, but once running, Windows performance did seem brisk. Two of the other hot-swap bays contained 1TB Hitachi SATA 7200 rpm hard drives, each with a 32MB cache.

Inside the cavernous case, the motherboard looked almost lost, taking up slightly more than 25% of the interior space. Digital Storm offers 13 different motherboards from different manufacturers. Our system was based on an ASUS P6X58D Premium SLI motherboard with an Intel X58 chipset, featuring USB 3.0 and a 6Gb/second SATA controller. This board provides a single CPU socket, which in our system contained an Intel Core i7 Extreme Edition 980X 3.3GHz six-core CPU, the same processor as in the BOXX workstation we recently reviewed (see January 2011 *DE*, page 14).

CPU cooling was provided in the form of an Asetek liquid



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High-Performance Computing /// Review

Digital Storm PROTUS

Price: \$6,545 as tested after discounts (\$2,683 base)

Size: 9.0 x 24.0 x 24.0 in. (W x D x H) tower

Weight: 55 lbs.

CPU: one Intel Core i7 X980 (six-core) 3.33GHz

Memory: 12GB DDR3 SDRAM at 1600MHz (up to

24GB supported)

Graphics: NVIDIA Quadro FX 3800

Hard disk: Intel 160GB Solid State, two Hitachi 1TB

SATA 7200 rpm drives with 32MB cache

Optical: LG Blu-ray Writer/Reader, LG Blu-ray Player/

DVD Writer

Audio: onboard integrated high-definition audio (microphone, line-in, front, side, rear and bass, plus

headphone and microphone)

Network: integrated 10/100/1000 LAN

Keyboard/Mouse: Logitech Media Combo MK200 keyboard and mouse (included for pricing purposes)

Other: nine USB 2.0, two USB 3.0, two 1394a (FireWire), S/PDIF, optical S/PDIF, PS/2 mouse, PS/2 keyboard, Blackmagic Design HD Intensity Pro add-on video card

CPU cooler with a 120mm radiator (which actually took \$26 off the system base price), although other cooling options run the gamut from simple fans and heat sinks to dual loop liquid cooling systems that can add as much as \$1,094 to the system price.

According to the spec sheet included with our system, Digital Storm charged \$199 to over-clock the CPU between 4.0GHz and 4.2GHz, but our tests indicated that the processor was running at a more sedate 3.5GHz.

The 750-watt Tech NPS power supply occupies the rearbottom case corner. Digital Storm offers seven other choices.

There are lots of fans spinning inside the massive case. Two large internal fans and three smaller fans on the top of the case circulate air, aided by another fan in the power supply, the fan on the graphics board, and two more large fans within the CPU cooling system. Amazingly, the system proved relatively quiet after the initial boot-up, but we definitely knew it was running.

Results Don't Justify the Price

Digital Storm pre-loaded Windows 7 Ultimate 64-bit edition (a \$51 up-charge). At our request, the company also installed Windows XP Professional 64-bit (at no additional charge) so that we could run our complete benchmark suite, including the SPECapc SolidWorks tests. The SPEC Viewperf scores, which focus solely on graphics performance, were quite respectable, but fell short of setting any records. This was surprising, considering the caliber of the graphics card.

But on the SolidWorks test, which breaks out graphics, CPU and I/O performance separately, the Digital Storm PROTUS chalked up the best results we've ever recorded. Because this test more closely mirrors the type of performance users can expect to experience when running an MCAD application, it is definitely worth noting. Similarly, on our own AutoCAD rendering test, which clearly shows the advantages of hyper-threading, the Digital Storm PROTUS completed the renderings in just over 46 seconds, thanks to its equivalent of 12 CPU cores.

Because configuring a Digital Storm system is an a la carte process, we did not request any other option. Because most users would likely opt to purchase a keyboard and mouse along with their computer, we included Digital Storm's \$28 cost for a basic Logitech keyboard and mouse in our system price.

Digital Storm backs its systems with a limited warranty that covers labor costs for three years and defective part replacement for one year. However, many of the components included in the system have longer warranties. According to the spec sheet, our evaluation unit was covered under the Digital Storm four-year Platinum Care Extended Parts & Labor warranty, which extends labor coverage to four years and parts replacement to two years. It also includes lifetime U.S.-based technical support (M-F, 9 a.m. to 5 p.m. Pacific Standard Time) and lifetime labor free upgrades for components purchased from Digital Storm.

Toward the end of our evaluation period, the system could no longer see the solid-state hard drive and would no longer boot, causing us to put Digital Storm's technical support to the test. Regrettably, no one was available to answer our call at 3:30 p.m. PST on a Tuesday. We left a message, but our call was not returned by the end of that business day. As we sent this issue to the printer, weeks later, our call still had not been returned.

As configured, our system priced out at \$7,606, but discounts available at the time of our review dropped the final cost to \$6,545. When it worked, the Digital Storm PROTUS workstation turned in excellent performance. But the experience left us with very mixed feelings. As an assemblage of parts, the completed system lacks independent software vendor (ISV) certification. And if you set out to build this system yourself, you could purchase all of the components for around \$4,000.

The poor response to our support call was the decisive mark against this system, making it difficult to recommend the Digital Storm PROTUS for critical engineering applications. DE

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

INFO → **Digital Storm:** DigitalStormOnline.com

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Design Engineering Workstations Compared

		Digital PROTUS workstation (d Intel i7-X980 o NVIDIA Quad 12GB	226060 one 3.33GHz six-core CPU, ro FX 3800,	4860 I workstation Intel i7-X980 (over-clocked NVIDIA Quadi	BDBOXX Extreme (one 3.33GHz) six-core CPU to 4.15GHz), to 5000, 12GB	(one 3.47 i5-670 d	lual core DIA Quadro	Lenovo D20 workstation (two 2.66GHz Intel Xeon X5550 quad core CPUs, NVIDIA Quadro FX 4800, 8GB RAM)		Lenovo S20 workstation (one 2.27GHz Intel Xeon E5520 quad core CPU, NVIDIA Quadro FX 3800, 4GB RAM)		HP Z800 workstation (two 3.2GHz Intel Xeon X5580 quad core CPUs, NVIDIA Quadro FX 4800, 12GB RAM)	
Price as tested		\$6,5	i45	\$6,	325	\$2.	089	\$5,943		\$3,8	885	\$10,604	
Date tested		12/13/10		11/14/10		8/7/10		1/11/10		7/29/09		4/24/09	
Operating System		Windows XP	Windows 7 64-bit	Windows XP	Windows 7 64-bit	Windows XP	Windows 7	Windows XP Windows Vista		Windows XP Windows Vista		Windows XP 64 Vista 64	
SPECviewperf	higher												
3dsmax-04		88.15	87.07	n/a	90.25	60.87	60.65	50.38	51.21	48.43	52.59	50.55	51.51
catia-02		74.35	84.85	n/a	115.36	68.13	66.87	61.79	62.01	60.40	60.61	62.10	61.66
ensight-03		62.22	58.33	n/a	120.41	53.85	53.06	55.26	53.51	51.74	55.33	53.99	53.62
maya-02		174.45	218.33	n/a	458.21	238.59	208.40	250.41	223.73	232.92	207.87	231.80	209.74
proe-04		83.16	77.29	n/a	114.34	68.03	65.74	64.83	63.66	61.56	64.49	63.59	61.48
SW-01		174.74	157.70	n/a	233.03	138.22	137.48	144.17	145.19	136.81	139.54	135.24	128.08
tcvis-01		40.16	37.36	n/a	95.26	35.60	34.81	40.55	39.51	29.17	38.76	28.93	28.29
ugnx-01		37.46	35.49	n/a	88.75	30.91	31.23	34.93	34.52	33.41	33.19	33.34	32.38
SPECapc SolidWorks	lower												
Score	seconds	106.51	n/a	n/a	n/a	148.72	n/a	141.59	n/a	140.42	n/a	145.17 ¹	n/a
Graphics	seconds	32.17	n/a	n/a	n/a	56.83	n/a	41.48	n/a	47.33 ¹	n/a	41.31	n/a
СРИ	seconds	25.87	n/a	n/a	31.63	32.81	n/a	33.00	n/a	31.01	n/a	32.68 ¹	n/a
1/0	seconds	47.99	n/a	n/a	54.68	63.10	n/a	67.73	n/a	65.86	n/a	71.94 ¹	n/a
SPECapc SolidWorks	higher												
Score	ratio	8.04	n/a	n/a	n/a	5.27	n/a	6.28	n/a	5.91 ¹	n/a	6.38	n/a
Graphics	ratio	6.07	n/a	n/a	n/a	3.23	n/a	4.68	n/a	3.92	n/a	4.85	n/a
СРИ	ratio	12.01	n/a	n/a	10.20	9.83	n/a	9.78	n/a	10.41	n/a	9.87	n/a
1/0	ratio	6.60	n/a	n/a	5.79	5.02	n/a	4.67	n/a	4.81	n/a	4.40 ¹	n/a
Autodesk Render Test	lower												
Time	seconds	53.5 ¹	4.6.3	n/a	39.6	137.4	135.2	64.00	63.60	99.0	117.6	59.00 ¹	52.00 ¹

Numbers in **blue** indicate best recorded results. Numbers in **red** indicate worst recorded results.

High-Performance Computing /// Review

The **Low-Cost** Lenovo ThinkStation E20

Lenovo's entry into the low-cost CAD workstation arena is incredibly affordable.

BY DAVID COHN

enovo has joined other workstation manufacturers with the introduction of a lowcost workstation aimed at entrylevel CAD users. With prices starting at \$450, however, the new ThinkStation E20 is the most affordable system yet from a major vendor.

The Lenovo ThinkStation E20 comes housed in a black case that bears a clear resemblance to other systems in the ThinkStation

lineup, although its implementation is more utilitarian

than its more powerful (and more expensive) siblings. Like the ThinkStation D20 we reviewed last spring (see *DE* May 2010), the E20 has a removable handle that adds 2 in. to the 14.81 in. height of the case, which measures 6.88x16.98 in. (WxD).

The top portion of the front panel provides two 5.25-in. drive bays, one of which contained a 16X DVD+/-RW dual-layer optical drive. A Blu-ray drive is optional. Below these is a smaller 3.5-in. bay that housed an optional 25-in-1 medial card reader. Below this is a sloping panel that contained two USB ports along with headphone and microphone jacks. Icons above these ports light up, making them easier to find in low-light conditions. To the right of these ports is the power button along with lighted indicators for power and hard drive activity.

The rear panel provides six more USB ports, a 9-pin serial port, RJ45 LAN port, and microphone, audio line-in, and audio line-out connectors. Our evaluation unit also came with a VGA monitor connector and Display Port connector. These were hidden beneath removable rubber covers and may not be usable on some E20 models. There's also provision for PS/2-style keyboard and mouse connectors, but those weren't present on our unit.

The Lenovo ThinkStation E20 is an extremely affordable workstation equipped with a single Intel dual-core i5 CPU and aimed directly at entry-level CAD users. Photo courtesy of Lenovo.

lenovo

Modest Expansion Options

To access the interior of the case, we had to remove two non-captive thumbscrews on the rear of the case and then press a button to remove the side panel. Inside, we found a Lenovo-designed motherboard with a single CPU socket housing an Intel Core i5-650 processor. This 3.2GHz dual-core CPU has 4MB of smart cache and is rated at 73 watts of thermal design power (TDP). CPUs ranging from the 2.8GHz Pentium G6950 up to the dual-core 3.46GHz Core i5-670 processor or the quad-core 2.93GHz XeonX3470 are available. The motherboard provides four DIMM sockets. Our evaluation unit came with 4GB installed as two 2GB DDR3 SDRAM 1333MHz memory modules. It can accommodate up to 16GB using 4GB DIMMs.

The motherboard provides just four expansion slots: one PCIe x16 graphics card slot, two PCI card slots, and a PCIe x1

Design Engineering Workstations Compared

		Lenov E20 workstation (one 3.19GHz Intel i5-650 dual core CPUs, NVIDIA Quadro FX 580, 4GB RAM)		HP Z200 workstation (one 3.47GHz Intel i5-670 dual core CPUs, NVIDIA Quadro FX 1800, 4GB RAM)		Lenovo D20 workstation (two 2.66GHz Intel Xeon X5550 quad core CPUs, NVIDIA Quadro FX 4800, 8GB RAM)		Dell Precision T3500 workstation (one 2.27GHz Intel Xeon E5520 quad core CPU, NVIDIA Quadro FX 3800, 4GB RAM)		Lenovo \$20 workstation (one 2.27GHz Intel Xeon E5520 quad core CPU, NVIDIA Quadro FX 3800, 4GB RAM)		HP Z800 workstation (two 3.2GHz Intel Xeon X5580 quad core CPUs, NVIDIA Quadro FX 4800, 12GB RAM)	
Price as tested \$1,224		224	\$2,089		\$5,943		\$2,544		\$3,885		\$10,604		
Date tested		9/15/10		8/7/10		1/11/10		7/30/09		7/29/09		4/24/09	
Operating System		Windows XP Windows 7		Windows XP	indows XP Windows 7		Windows Windows XP Vista		Windows XP Windows Vista		Windows XP Windows Vista		Windows Vista 64
SPECviewperf	higher												
3dsmax-04		66.73	64.98	60.87	60.65	50.38	51.21	39.91	42.75	48.43	52.59	50.55	51.51
catia-02		68.28	63.79	68.13	66.87	61.79	62.01	51.85	53.33	60.40	60.61	62.10	61.66
ensight-03		45.79	43.40	53.85	53.06	55.26	53.51	47.26	47.84	51.74	55.33	53.99	53.62
maya-02		185.81	157.57	238.59	208.40	250.41	223.73	220.79	199.04	232.92	207.87	231.80	209.74
proe-04		64.08	59.17	68.03	65.74	64.83	63.66	55.67	55.54	61.56	64.49	63.59	61.48
SW-01		97.07	89.67	138.22	137.48	144.17	145.19	123.28	120.57	136.81	139.54	135.24	128.08
tcvis-01		23.66	23.00	35.60	34.81	40.55	39.51	28.71	28.07	29.17	38.76	28.93	28.29
ugnx-01		23.15	16.93	30.91	31.23	34.93	34.52	33.40	32.27	33.41	33.19	33.34	32.38
SPECapc SolidWorks	lower												
Score	seconds	153.29	n/a	148.72	n/a	141.59	n/a	178.39	n/a	140.42 ¹	n/a	145.17 ¹	n/a
Graphics	seconds	58.71	n/a	56.83	n/a	41.48	n/a	62.99	n/a	47.33 ¹	n/a	41.31	n/a
CPU	seconds	33.67	n/a	32.81	n/a	33.00	n/a	36.38	n/a	31.01	n/a	32.68 ¹	n/a
1/0	seconds	65.44	n/a	63.10	n/a	67.73	n/a	83.35	n/a	65.86	n/a	71.94 ¹	n/a
SPECapc SolidWorks	higher												
Score	ratio	5.21	n/a	5.27	n/a	6.28	n/a	4.66	n/a	5.91 ¹	n/a	6.38	n/a
Graphics	ratio	3.25	n/a	3.23	n/a	4.68	n/a	2.92	n/a	3.92	n/a	4.85	n/a
СРИ	ratio	9.58	n/a	9.83	n/a	9.78	n/a	8.80	n/a	10.41	n/a	9.87	n/a
1/0	ratio	4.84	n/a	5.02	n/a	4.67	n/a	3.80	n/a	4.81	n/a	4.40 ¹	n/a

Numbers in **blue** indicate best recorded results. Numbers in **red** indicate worst recorded results.

High-Performance Computing /// Review

card slot. The graphics card slot in our system was filled with an NVIDIA Quadro FX 580 graphics accelerator equipped with 512GB of memory. Lenovo also offers other graphics options, including the less-expensive Quadro FX 380 and the more powerful NVIDIA Quadro FX 1800. At a premium of just \$360, we'd probably opt for the FX 1800.

The Lenovo ThinkStation E20 has two internal drive bays with quick release acoustic dampening rails, one mounted just below the front panel in its own removable cage, and a second attached to the bottom of the case. For our review, the E20 was equipped with a 500GB Seagate Barracuda 7,200 rpm SATA drive. Lenovo offers other 7,200 rpm SATA drives ranging from 250GB up to 1TB as well as a 300GB 10,000 rpm drive. Systems with two drives can be factory configured in RAID arrays.

A 280-watt power supply provides enough power to handle the modest expansion options. As we've come to expect, the system was virtually silent during normal operation, although the optical drive was extremely noisy when installing new software.

Performance Choices

Lenovo pre-installed the 64-bit version of Windows 7 and also sent us a second hard drive that we could swap out so that we could repeat all of our benchmark tests using 32-bit Windows XP. The system was also configured with hyper-threading enabled when we first received it. While that enables the dual-core CPU to appear to the operating system as four separate processors — and is useful when running multi-threaded applications — it can slow other processes. For example, our SolidWorks test results improved significantly when we disabled hyper-threading. But our AutoCAD rendering took a minute longer with hyper-threading turned off. Since this can only be toggled within the BIOS during the initial system boot, you'll have to determine what works best for you.

We were surprised at how well the E20 performed compared to other, more expensive systems. The review unit, equipped with the NVIDIA Quadro FX 580 turned in some of the fastest scores on the SPEC viewperf benchmark, while on others, its results were the slowest among recently tested systems.

When we turned our attention to the SPECapc SolidWorks benchmark, which is more a real-world test, the E20 lagged behind the other systems we've tested, due to its slower CPU and entry-level graphics. Similarly, on the AutoCAD rendering test, the ThinkStation E20 took more than three minutes to complete the rendering with hyper-threading enabled, and more than four minutes with it disabled, the worst performance by a rather large margin among workstations we've recently reviewed.



Lenovo rounded out our evaluation unit with its Preferred Pro USB Fingerprint keyboard, a full-size 104-key keyboard with an integrated fingerprint sensor and accompanying software so you can swipe a finger across the sensor rather than typing passwords. A Lenovo-branded optical wheel mouse was also included.

In addition to the 64-bit versions of Windows 7 that we received, Lenovo offers Windows XP, Windows Vista, and Red Hat Linux, or you can also order a system with no operating system installed. Lenovo backs the system with a three-year limited onsite warranty with other warranty upgrade options available.

Although base systems start at \$449, that's for an extremely basic system with no operating system. As configured, our evaluation unit priced out online at \$1,224. Even if you were to upgrade to a faster CPU and more powerful midrange graphics card, you could still pay less than \$1,500. Once again, Lenovo has delivered a very impressive system, at an incredibly affordable price. DE

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

INFO → Lenovo:lenovo.com/thinkstation

Lenovo ThinkStation E20

- Price: \$1,224 as tested (\$449 base)
- Size: 6.88x16.98x16.74 in. (WxDxH, w/handle) tower

- Weight: 24 pounds
- CPU: one Intel Core i5-650 (dual-core) 3.2GHz
- Memory: 4GB DDR3 SDRAM at 1333MHz
- Graphics: NVIDIA Quadro FX 580
- Hard Disk: one Seagate Barracuda 500GB SATA 7,200 rpm drive
- Floppy: none
- Optical: 16X DVD+/-RW Dual-Layer
- Audio: onboard integrated high-definition audio (microphone, headphone, line-in, line-out, and internal speaker)
- Network: integrated 10/100/1000 LAN
- Modem: none
- Other: One 9-pin serial, six USB 2.0, 25-in-1 media card reader
- Keyboard: 104-key Lenovo Preferred **USB** Fingerprint keyboard
- Pointing device: USB optical roller wheel mouse

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Taking the **Heat**

Computational fluid dynamics analysis puts a tiny cooling fan — a microcooler — to the test.

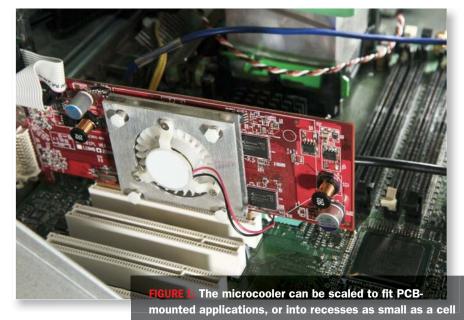
BY IAN CLARK

akers and users of electronic products of all kinds have been repeating the "smaller, denser, faster" litany for years. And indeed, each new generation of devices delivers these advantages - to the point where a cell phone, for example, can be made as small as any human hand can manage.

One side effect of this continual downscaling is the inevitable buildup of internal heat in all these devices. Lowpower semiconductor components and passive heat-sinking schemes have sufficed so far, but now the time has come for active heat removal. For years, CPU chips and graphics processors have used small fans mounted atop the integrated circuit (IC) device. But even these miniature air movers are far too large for some applications on the drawing boards today.

Into this milieu comes an emerging class of microcoolers — fans small enough to fit within a tiny recess, such as the memory card slot of a cell phone. Built into a simple housing that itself acts as a heat sink, a microcooler can be about the size and thickness of a coin. Yet these smallest units can disperse up to 3 watts of heat, and larger versions can move 40 watts and more using integrated heat pipes. As Figure 1 shows, the microcooler dispenses with finned heat sinks saving cost, space and manufacturing complexity.

The technology evolved after more than five years of extensive research at the Stokes Institute (SI) at Ireland's University of Limerick. The facility takes its name from George Gabriel Stokes (1819-1903), co-creator of the Navier-Stokes fluid dynamics equations that are at the heart of computational fluid dynamics (CFD) analysis. SI is renowned for its research into thermal phenomena and cooling technologies.



phone's memory card slot. Image courtesy of Mentor Graphics Corp.

SI's researchers identified a series of previously unreported cooling interactions that could be manipulated to create more efficient thermal management of electronic devices. They discovered an innovative method of combining newly characterized fluidic behavior with specially arranged cooling surfaces. The result is a high-performance, lowprofile cooling technology that combines low acoustic noise generation with high reliability and energy efficiency.

Microcoolers open the door to active cooling in the tiniest spaces within electronic systems. Mobile devices stand to gain reliability, as well as new features and greater range. Larger system-level products get new flexibility in printed circuit board (PCB) and enclosure layout, with implications for packaging and physical compactness.

Simulation & Analysis /// CFD

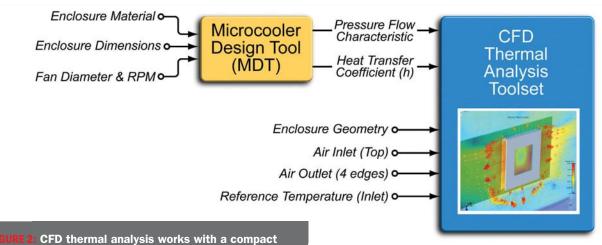


FIGURE 2: CFD thermal analysis works with a compact microcooler model, based on parameters from an external design tool plus user-specified geometries and conditions. *Image courtesy of Mentor Graphics Corp.*

CFD Adaptations

New technologies are tempting, but they can be risky, too. It takes a brave designer to invest his or her reputation — and that of an important new product — in an untried component. But increasingly, designers are learning that it's not necessary to spend precious development time on hardware prototypes. Instead, they are turning to thermal analysis with modern CFD tools.

CFD played an important role in the development and validation of the new active cooling architecture, and is the right tool to help designers implement microcooler solutions in their end products. SI researchers worked with inhouse design tools and the Mentor Graphics FloTHERM CFD analysis application to predict thermal responses as the fan design evolved.

The key to efficient CFD analysis is a workable compact model. Most models are intentionally simplistic, but they embody the essential properties of the device. The rule of thumb is to optimize the model's level of detail only to the degree that provides usable results when calculating terms such as thermal resistance.

For example, experience has shown that a simple resistive-capacitive equivalent network model can suffice to describe a rather complex heat flow path. Modeling and analyzing a microcooler is akin to designing a conventional heat sink, though the fan's active nature — a rotating element forcing air to move — requires a few more details in the definition.

In the process developed by SI researchers, building a microcooler compact model is a two-step operation. It begins with an in-house microcooler design tool (MDT) that accepts a fundamental physical description of the device.

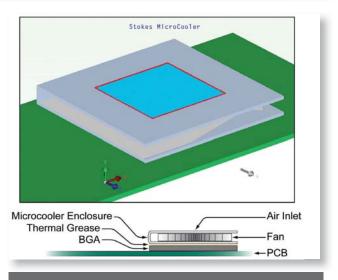
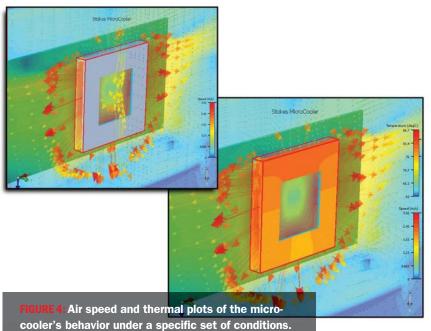


FIGURE 3: A graphic representation of the microcooler compact model. *Image courtesy of Mentor Graphics Corp.*

Entries include the dimensions (length, width, height, metal thickness); materials that make up the housing (typically, aluminum); fan diameter and height, fan speed and more.

The outputs of this design tool are the pressure-flow characteristic of the fan and, importantly, the thermal resistance of the microcooler, commonly expressed as °C temperature rise per watt. The thermal resistance is also used to extract the effective heat transfer coefficient acting on the microcooler's inner surfaces. Knowledge of the heat transfer coefficient is what enables a designer to treat a microcooler as a normal heat sink — though an extraordinarily efficient one.

Interestingly, the microcooler is easier to model than the CPU fan/heat sink combinations found in PCs everywhere



today. That is because the MDT delivers both the aerodynamic characteristics (how much air the microcooler fan will move) and the thermal resistance as they pertain to one integral unit.

Image courtesy of Mentor Graphics Corp.

Given the pressure-flow and heat transfer characteristics, the next step is to build a model for a CFD tool such as FloTHERM in preparation for the analysis. The model incorporates as inputs additional fan details and enclosure geometry, as summarized in Figure 2.

Figure 3 depicts the graphic representation of the model from the CFD application. The elevation view shows the semiconductor device and thermal interfaces not included

The Bottom Line

ctive cooling at the individual integrated circuit level is no longer a discretionary choice in many system designs. Many researchers and analysts familiar with microcooler technology believe the new devices can address emerging cooling challenges that are beyond the reach of conventional finned heat sinks, particularly for small-scale, low-profile applications. Computational fluid dynamics analysis has the proven potential to aid designers tasked with introducing the new device into a generation of highperformance electronic systems.

in the model view. The ball grid array's (BGA's) semiconductor chip, the epicenter of heat in this analysis, is positioned directly below the center of the microcooler fan.

Note that the fan itself is represented as a square, even though the actual fan is, of course, circular. This is done to simplify modeling and minimize simulation time. After all, this is a "compact" model.

One of the four faces of the square appears to be impeded by the folded edge of the enclosure. But the air coming off the fan itself — its blades - is of interest here, and the closed edge doesn't prevent air from emerging from the blades.

Proof of Performance

Figure 4 shows a pair of output plots that have been solved by a CFD tool — in this instance, FloTHERM. Both views slice through the center plane of the microcooler.

In the upper view of Figure 4, all the arrows (vectors) equate to air flow speed. Color denotes speed, with red equating to the highest value — about 3 meters/second. Clearly, the microcooler is dispersing volumes of air from three of its edges. Some air goes upward and bounces off the top wall of the enclosure, but is discharged to the right and still contributes to overall cooling. A group of yellow arrows maps the path and speed of the incoming air at the inlet.

The lower view adds temperature data for the enclosure while retaining the speed vectors. Here, the hottest parts of the surface are those closest to the IC component, with slightly lower temperatures toward the periphery of the microcooler. All internal surfaces of the microcooler manifest a very aggressive heat transfer coefficient, however, achieving efficient heat removal.

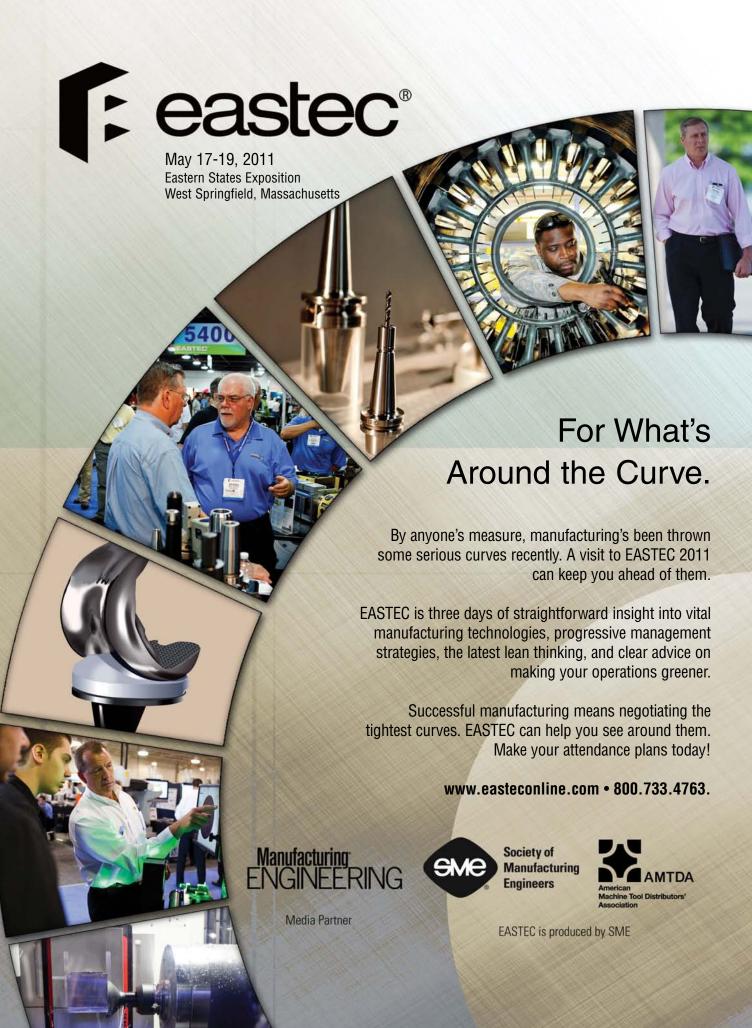
The interpretation of the plots in Figure 4 depends on the allowable temperature ranges in the BGA and its surroundings. CFD tools provide an expedient means to predict whether component temperatures are acceptable and to analyze air-flow patterns and velocities at the PCB level. DE

Ian Clark is product manager for the Mechanical Analysis division of Mentor Graphics Corp.

INFO → **Mentor Graphics:** Mentor.com

→ Stokes Institute: Stokes.ie

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A Face in the Cloud

Online communities and remote computing bring about social engineering changes.

By Kenneth Wong

n December 2010, a pair of inquisitive, green eyes on the cover of Time magazine stared at holiday shoppers from newsstands, magazine racks and bookstores everywhere. It was the cover featuring Time's Person of the Year. According to the accompanying article, the spotlight fell on Mark Zuckerberg, founder and CEO of Facebook, "for connecting more than half a billion people and mapping the social relations among them, for creating a new system of exchanging information, and for changing how we live our lives."

Born out of a socio-technological experiment in a Harvard dorm room (or so the

legend goes), Zuckerberg's social networking enterprise has also changed the way we design. Now, design software makers large and small — from established names like Autodesk, Dassault Systèmes (DS), and PTC to upstarts like GrabCAD — are looking to introduce social media-inspired features into the collaborative workflow. An essential part of this revolution — let's call it social engineering — is the cloud, the shared network.

Communal Content, Social Concepts

In February 2009, when SolidWorks, a DS subsidiary, decided to relaunch its free content-sharing community 3D Content Central, it took cues from Facebook — all the way to the light-blue color scheme and the minimalistic fonts. The revamped CAD community offered, among other things, the option to browse user profiles, comment on user-submitted 3D models (as you might your friends' Facebook photos), and rate them (as you might random YouTube videos). In the latest release of the company's SolidWorks CAD software (SolidWorks 2011), supplierand user-submitted 3D models from 3D Content Central are accessible for download right from the CAD modeling window. Also, if you want to share a model with the community, you'll be able to upload it to 3D Content Central right from the program window.

SolidWorks' parent company, DS, maintains a commu-



Models uploaded to 3D Content Central, readily available for download from within SolidWorks 2011's modeling window.

nity associated with its 3DVIA product line, a consumerfriendly lightweight 3D modeling and game development platform. Like 3D Content Central, the 3DVIA community also offers comments, rating, user profiles and other social media-like functions. Next year, DS plans to offer a projectmanagement platform with social media-inspired features, called 3DSwYm (currently in closed beta, accessible to invited testers only).

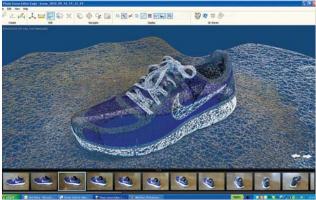
PTC, makers of Pro/ENGINEER (now rebranded as Creo Elements/Pro), maintains a community called Planet PTC — complete with blog posts, video clips and discussion forums. The company plans to incorporate Windchill SocialLink, an Instant Messenger-like panel that promotes community-powered product development.

Possibly the youngest of the lot, GrabCAD, another free 3D content library powered by members, came online in 2009. Though at press time its registered members currently totaled a mere 1,400 or so, company founder and CEO Hardi Meybaum reports that "we are growing — 100% month over month." In addition to shared content, GrabCAD also offers model conversion, technical drawing

Focus On Collaboration /// Cloud Computing



Constructing a 3D scene using 2D photos of an object taken from various angles.



In the next version of Autodesk's Project Photofly, you will be able to export the 3D scene as mesh data.

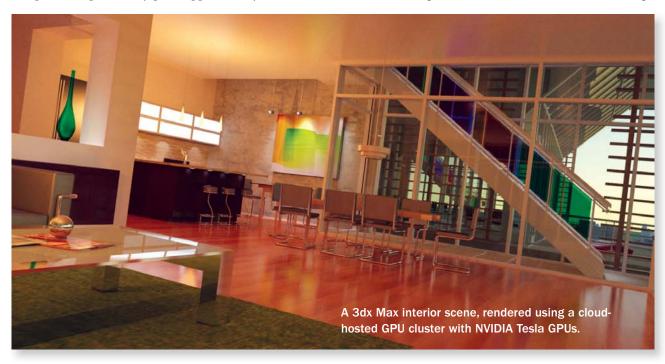
production, rendering and other complementary services.

As user-driven CAD communities spring up, some uploaded designs take on new lives, ending up in unexpected places. One of the most popular items on 3D Content Central is an assembly model of Homer Simpson holding a beer can and a doughnut. Its creator, Chris Tabern, wrote, "As an assembly, it's absolutely awful and I'm horrified that over 18,500 people have downloaded it." But that was in 2008. Today, Homer has been downloaded 60,515 times. Commenting on it, one member revealed, "We simulate a walkthrough [of] our facility with Homer. This is very funny for the spectators."

Tabern's Homer, other users' works, and standard components uploaded by part suppliers are yours for the experimenting. You may use them for inspiration, production — or laughter.

Not Just for Storage

The cloud is not just a virtual vault with infinite storage capacity, however. It's also home to hundreds of supercomputers, dedicated servers with infinite computing horsepower. Up to now, for mere mortals, computing is, simply put, operating a box — a desktop, a laptop or a workstation. Sure, there are those with access to university research laboratories equipped with giant clusters. But these are the deities of high-performance computing (HPC), blessed with the authority to wake up mythical monsters like Jaguar or Blue Gene (installed at Oak Ridge



SOCIAL STATISTICS

- Facebook, founded 2004: 500 million+ members
- The United States of America, founded 1776: 308 million+ people (April 2010 census results)
- 3D Content Central, founded 2003: 727,000+ members
- 3DVIA community, founded 2007: 228,000+ members
- GrabCAD community, founded 2009: 1,449 members

and Lawrence Livermore National Labs, respectively).

The new computing paradigm, dubbed "infinite computing" by Autodesk, seeks to extend design and engineering beyond our individual boxes, giving us a way to reach into the supercomputers in the cloud. This means you can now compute like, and compete with, industry titans. Unlike Oak Ridge or Lawrence Livermore, you don't have to shoulder the burden of feeding and housing an HPC monster onsite; you just need to pay for borrowing it.

Borrowing Computing Cycles

Several technology previews currently available at Autodesk Labs exemplify how Autodesk plans to incorporate on-demand HPC into its software titles. One of them, Project Photofly and Photo Scene Editor, lets you upload a series of digital photos of an object taken from slightly different angles, then convert them into a 3D scene comprising editable points. In the future, the software will let you export the constructed scene as mesh data.

The workflow lets you bypass the need to use digital scanners to capture the shape of an object, then export the results as point cloud data, editable in a CAD program like AutoCAD. The most computing intensive operations — automatic analysis of the uploaded photos, identifying points in 3D space and reconstruction of the scene — take place in a remote server cluster in the cloud, not in your own desktop's CPU.

Similarly, Project Centaur, a technology preview that's destined to become part of Autodesk Inventor, lets you upload your Inventor 3D model to a remote server, run a series of optimization tests, and retrieve recommended parameter changes. The plug-in uses the processors in a remote cluster to solve optimization equations, so your own Inventor session won't be subjected to a performance decrease.

Cloud-hosted Rendering

Another technology in development is expected to let Autodesk 3ds Max users tap a remote GPU cluster to render their 3D scenes. By offloading the ray-tracing algorithms to a dedicated GPU cluster in the cloud, 3ds Max can perform the operation in just a fraction of the time it would have taken to do the same on a desktop or a laptop.

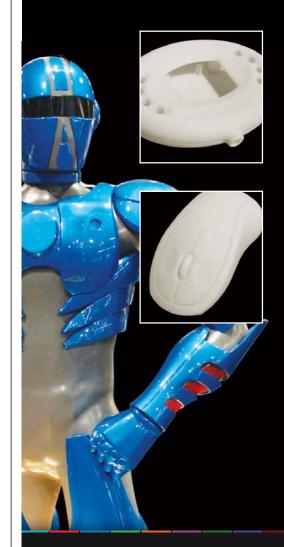
"[Cloud-hosted GPUs] are all running exactly the same iray software [from mental images, a subsidiary of NVIDIA] that comes with 3ds Max," said Michael Kaplan, VP of strategic development, mental images. "We can guarantee that the image that you get from [the cloud-hosted iray renderer] is exactly the same, pixel for pixel, as what you would get from 3ds Max."

Similarly, Autodesk is developing a browser-based rendering tool, dubbed Project Neon. The application lets you upload DWG files with pre-defined camera angles to a remote server from a browser, then retrieve rendered images. Like the 3ds Max function mentioned above, Neon uses the horsepower of a cloud-hosted cluster to render the DWG files, so your local CPU and



Your Virtual 3D Printer

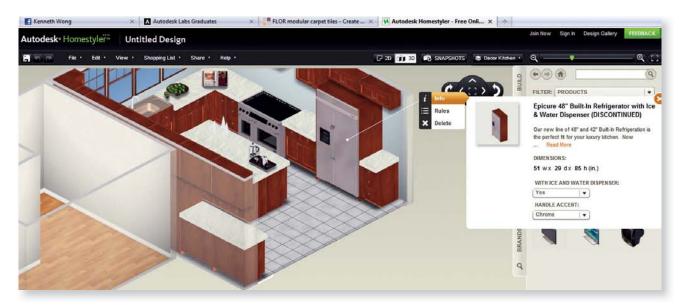
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Autodesk Homestyle exemplifies how cloud-hosted design data and remote rendering can create interactive sales and marketing applications.

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GPU remain free to run other applications.

Whereas Project Neon is still in test phase, Mackevision's F_BOX Picture Shooter, a fully functional browser-based rendering application, is already in the market. No client software, no installation. All you need to use the web-hosted software is a log-in and a password. Primarily meant as a rendering program for manufacturers who need to churn out many iterations of a product, you may use F_BOX Picture Shooter and the Media Server to let authorized digital artists render photo-realistic images of the same product. The application uses Chaos Group's V-Ray GPU-accelerated rendering technology to deliver images. See page 8 for more details.

New Experiences for Consumers

If the vision of DS' CEO Bernard Charles comes true, shopping for a Valentine's Day present for your significant other online will no longer be the same. You may still log on to his or her favorite store. But, instead of looking at a JPEG thumbnail of the item you've been receiving hints about for months, Charles imagines you'd be inspecting a 3D model of the product, which you can flip, open, rotate and even switch color.

Charles isn't conjuring up a romantic vision — even though, as a French man, he's entitled to. With his company's design software, he's actively promoting the use of what he calls "lifelike experiences" to extend the lifecycle of 3D design data.

Early examples of Charles' vision can be seen at French luxury good merchant EspaceMax's website. In partnership with DS, the retailer has created several 3DVIA-powered scenes with designer handbags and purses to allow online shoppers to interact with the

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product virtually. (To view the scene, visit Espacemax. com/experience3d/experience_sequoia.html.)

Autodesk's version of the same application can be seen in Autodesk Home Styler, a web-based application that lets you plan a room by dragging and dropping objects, visualize the result as a rendered 3D scene, and share snapshots of your creation on Facebook. Merchants like tile maker FLOR, kitchen appliance maker Dacor and other household brands supply the material choices.

This emerging practice — using cloud-hosted design data to let consumers digitally experience products before they buy them — extends engineering beyond manufacturing into sales and marketing.

Open-source Design?

Zuckerberg's social network becomes a success story partly because of the technology that lets us connect across time and space. Perhaps more important, for reasons sociologists will continue to debate for years, we made a conscious decision to leave the cocoon of isolation to join the cyber masses, to take a chance on millions of strangers around the world.

The culture shift, high bandwidth connections and

new strategies by software makers are expected to revolutionize the design discipline, too, from an isolated process confined to secrecy to a social experience conducted in the open. **DE**

Kenneth Wong is CEO of Stratasys, a maker of additive manufacturing machines for prototyping and producing plastic parts. Send e-mail about this commentary to de-editors@ deskeng.com.

INFO -> Autodesk: USA.Autodesk.com

→ Dassault Systèmes: SolidWorks.com

→ Facebook: Facebook.com

GrabCAD: GrabCAD.com

Mackevision: Mackevision.de

→ mental images: mentalimages.com

→ NVIDIA: NVIDIA.com

→ PTC: PTC.com

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Power to the People

Is crowdsourcing the next step in outsourcing or a new way to collaboratively engineer products?

By Mark Clarkson

et's say your local college basketball team wants to create new T-shirts to sell to fans, alumni and other boosters. The team announces a competition for the new design. Interested parties submit their designs, and those designs are published on the school's website, where anyone can vote on them. The design that garners the most votes is printed on the new T-shirts.

That's *crowdsourcing*: leveraging the power of the crowd to do all the heavy lifting. The crowd creates the designs, votes on the designs and, ultimately, buys the T-shirts. All the school has to do is post the entries and track the votes.

The idea is actually pretty old. There have always been contests, competitions and scholarships. The logo of Italian petroleum company AGIP (now ENI) — a six-legged, firebreathing dog — was the result of a popular competition way back in 1952 that pulled in around 4,000 entries.

Crowdsourcing, though, has been greatly facilitated by the Internet. It is turning from an occasional lark to a viable business model for an ever-expanding range of businesses.

Internet T-shirt retailer Threadless, for example, has been very successful with the above-described business model: Anyone can submit and vote on T-shirt designs. The most popular designs are produced as shirts for sale on the site.

Up until now, crowdsourcing has largely been restricted the domain of graphic design: logos, T-shirts, CD covers, websites, etc. In fact, that's still the vast majority of crowdsourcing projects. But that's beginning to change.

From Crowds to CAD

Consider crowdsourcing giant crowdSPRING, which averages approximately 225 open projects at any given time. It boasts a community of more than 75,000 designers, photographers and writers from 185 countries. crowdSPRING started with graphics projects, but has since added photography, writing and, yes, industrial design.



The Premium concept phone took second place at LG's 2010 Design the Future competition. It was one of more than 1,000 entries.

The site has hosted product design projects for everything from pasta shapes to adult toys (the former was just looking for drawings; the latter required 3D CAD files.) At press time, a project to design innovative concepts for steam irons, posted by Royal Philips Electronics, is just wrapping up. First place pays \$4,500 plus a copy of Autodesk Alias Design.

"Industrial design works beautifully for crowdsourcing," says crowdSPRING's co-founder, Mike Samson. "In fact, we believe that the model works well for many kinds of creative services — as long as they meet a couple of basic criteria. If the design can be delivered digitally, crowdsourc-



Winning concept for the Embracer Sportband Project.

ing works. And as long as you can effectively compare two entries side-by-side, crowdsourcing works."

So a simple piece of writing — this article, for example — is entirely crowdsource-compatible. Translating this article into, say, Romanian, is not: I don't speak or read Romanian, so I can't effectively compare translations and choose among them.

By Popular Demand

Crowdsourcing tends to the low end of the market. Most crowdsourcing customers are small businesses who couldn't normally afford the services of a product designer at all. But there are exceptions.

Korean electronics manufacturer LG holds an annual Design The Future competition to look for new cell phone concepts. It has hosted the last two as crowdSPRING projects, and will be hosting the next in early 2011. LG offers more than \$80,000 in awards. In return, it receives hundreds of designs from which to choose. The last competition drew around 1,200 entries. Some of the resulting designs are in the production process now.

"The first LG project is what allowed us to start building this community of industrial designers," says Samson. "We have several thousand registered on the site. Many of them are very experienced industrial designers, but we also get a lot of students. In fact, a team of students from a Virginia Tech industrial design class won first place in 2010. The instructor gave it as an assignment, broke them into teams, and one of the teams won.

"The woman who won the first LG project was an industrial designer," he adds. "LG liked her so much, they hired her and moved her to San Jose. Not only did she win \$20,000, she also got a job out of it."

The Big Idea

For big companies like LG, the major attraction of crowd-



The Flutter concept phone design from LG's 2010 Design the Future competition, hosted on crowdSPRING.

sourcing is the wealth of new ideas. They're not usually looking for production-ready CAD files. Take Italian food company Barilla, who went to crowdSPRING in search of new shapes for its line of pasta — and in return received hundreds of ideas.

"Barilla doesn't care about the technical specs of the pasta shape," says Samson. "All they care about is a great idea. They're going to do the actual design in-house."

Samson predicts that will be the approach many manufacturers will choose for crowdsourcing: "They'll look for new concepts, then hand it over to their engineering departments to convert those concepts into real engineering drawings that they can control.

"But having said that, we have a nice relationship with Autodesk, who has company-sponsored some of these projects," he continues. "They're making the trial version of AutoCAD available to anyone who wants to participate in the project,

Focus on Collaboration /// Crowd Sourcing





One potential design from a crowd-sourced camera bag project on crowdSPRING.



so you can create your steam iron or your LG phone concept using AutoCAD."

The Down Side

High-visibility projects, like those from Philips, LG and Barilla, attract more designers to sites like crowdSPRING. "When we're lucky enough to get a flagship project, it accelerates the community-building process for us," Samson reports. "For us, that's what it's about: building a community."

There's a problem with this rosy picture, though.

Most crowdsourcing projects sell for a small fraction of what a designer would charge. While that's good for the buyer, it's harder to see it as being good for the design community as a whole.

Remember that LG project? With 1,200 entries vying for \$80,000 in awards, the average payout is only \$66. Of course, no one earns that average; there are a few winners and more than 1,000 ... well, if not losers, then not winners, either. The vast majority of participants receive nothing at all.

"We never claimed our model is for everybody," says Samson. "It's a disruptive model. For industry incumbents, it's not just the pricing, it's the competition. All of a sudden, you're not just competing with designers from your hometown or your region or your country, but from all over the world, from Malaysian or eastern Europe. That can be perceived as a threat."

That may be soft-pedaling the problem. Designers are already used to competing with designers from Malaysia and eastern Europe. Crowdsourcing means you're also competing with students and talented amateurs from Malaysian and eastern Europe.

Is it a Threat?

crowdSPRING isn't alone. There are a few other places out there crowdsourcing product design of one sort or another. Redesignme.com offers product design "between US \$445 and US \$992." Again, the projects are mostly graphics, but you'll find a few product designs sprinkled in there: a new doorknob, or a better sleeping mask.

RYZ Footwear makes men's athletic shoes with a model similar to Threadless'. Local Motors is trying to use the power of the crowd to design and build new cars.

So should you be afraid for your job? It depends. It's doubtful that GM will be crowdsourcing the starter motor on the Escalade anytime soon. On the other hand, if you design packaging for small vineyards, your business is about to get a lot more competitive. DE

Contributing Editor Mark Clarkson is DE's expert in visualization, computer animation, and graphics. His newest book is "Photoshop Elements by Example." Visit him on the web at markclarkson.com or send e-mail about this article to de-editors@ deskeng.com.

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Commentary

Make Your Network Work

echnology has transformed how we work, live and interact with each other. With mobile devices, applications and technology, workers are no longer tethered to the workplace. Web-based technology fosters collaboration worldwide and acts as a catalyst for improved efficiency.

For example, open source software has a successful model. Setting aside debate around terminology, licensing and intellectual property (IP), the open source model enables software to be developed openly and collaboratively. Android devices exemplify successfully leveraging the wisdom and collective expertise of a large and diverse technology community.

As Web-based technology continues to evolve, so, too, will collaboration in engineering. Engineers seek answers to a variety of technical questions related to material selection, standards and safety. For answers, engineers tap trusted references, seek subject matter experts and collaborate with colleagues. The best answer may not be from the engineer down the hall.

"It's not what you know ... It's what your network knows."

Why not query a larger pool of experts in the engineering community?

One way to do this is by leveraging social platforms. Knovel recently hosted a social networking webinar where one of the panelists, an Outsell, Inc. analyst, highlighted key findings of a 2009 engineering survey, including:

- 56% of engineers surveyed use a social network;
- 33% use social networking for professional purposes; and
- 27% use LinkedIn for professional or both professional/ personal purposes.

In 2011, we'll continue to see the more sophisticated use of social platforms, particularly those focused on interests, ideas and problem-solving specific to verticals such as engineering.

Community and Crowdsourcing

Community is no longer confined to physical location. Social networking tools, including Facebook, LinkedIn and Twitter, have changed how we build community and interact with friends, colleagues, peers and strangers.

Companies including Dell and Proctor & Gamble (P&G) use external networks to collaborate on product development. Dell, for instance, has used crowdsourcing, the act of outsourcing or collaborating with external audiences, to improve its products and services. There are a variety of crowdsourcing models that can be used for product development and research to elicit input directly from customers or other engineers willing to share their talents, ideas and critiques.

Through its Connect+Develop initiative, P&G has embraced external collaboration to enhance its product line. Launched in 2001, some of the Connect+Develop innovations include Swiffer dusters, Tide Total Care and Mr. Clean Magic Eraser. By collaborating with other organizations, consumers and inventors, P&G has helped to spur innovation.

As engineers become more engaged in "open innovation" and collaborate to solve discreet problems online, both intra- and inter-organizationally, companies will find ways to overcome concerns about proprietary IP and security when engineers are talking to other, potentially competitive, organizations.

One way they may do this is by focusing on issues that are simply a subset of the overall project. This way, the external community cannot identify the whole.

Some collaboration may be driven by pushing the limits of innovation and industry firsts. The recent successful rescue of the Chilean miners is just one example of what engineers can accomplish with access to worldwide resources.

Mobility Plays a Role

Smartphones and tablets have given users immediate access to information that allows collaboration anytime, anywhere. Recognizing this rising mobile tide, vendors are evolving functionality to ensure users can connect to their software and other applications via mobile devices.

Many desktop applications engineers use require large processing power on the client side, but there is a shift toward lightweight software or cloud computing. This will enable users to be more mobile—and more importantly, better able to collaborate with peers across the world. You can see this with server side applications that are now being developed to compete with established CAD, CAE and process design systems. These newer systems will provide a more easily accessible, lower-cost alternative.

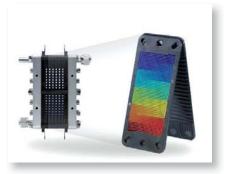
The possibilities for collaboration are endless, and the adage "consider the source" is taking on new meaning. As a new decade begins, collaborative, Web-based technologies will be in great demand by organizations that maintain global staffs, work with independent contractors, and employ telecommuters. As today's product design and development issues become more complex, engineers will want to seek expertise beyond company walls. DE

Chris Forbes is president, founder and CEO of Knovel. Send comments about this commentary to de-editors@deskeng.com.



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 Lockwood's most recent musings about the products that have really grabbed his attention.



Simulate Electrochemical Devices

New batteries and fuel cells module for COMSOL Multiphysics.

COMSOL has introduced the Batteries & Fuel Cells Module for its COMSOL Multiphysics engineering and scientific analysis environment. This is an add-on expansion module, one that might be of interest to you if you're charged with analyzing electrochemical batteries and fuel cells.

The module gives you a toolbox for set-

ting up, simulating, and studying batteries and fuel cells within the COMSOL modeling and simulation environment. You can analyze your device with a variety of physical properties under coupled physics conditions: electrochemical reactions, flow, heat transfer, and electric fields.

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Balloon Inspection Data Automatically

InspectionXpert for CATIA supports 3D models and 2D drawings.

Extensible CAD Technologies' InspectionXpert for CATIA V5 is designed to take the tedious job of building your first article as well as in-process inspection reports and make it as efficient as possible through automation. With this CAD-integrated product, you can capture inspection dimensions, notes, geometric tolerances, hole callouts,

and other data directly from your CATIA 2D drawings and 3D models. And you can have it automatically balloon inspection characteristics directly onto your 3D CATIA models. And all of this data can be placed into customizable and filtered Excel-based forms for vour clients or for the boss.

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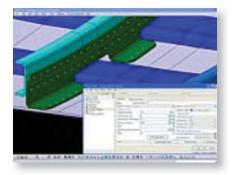
Developer Library Unites Sub-D and NURBS Paradigms

IntegrityWare's SubD-NURBS links concepts to CAD.

IntegrityWare specializes in 3D geometric modeling and graphics technology solutions - things like NURBS and polygon-based software libraries. These guys develop the stuff that runs in the background of your analysis, manufacturing, and engineering applications, which makes what you see and do in the foreground work like a charm.

The company has this project called the "Technology Gem Initiative" to develop 3D technologies that target and solve a particular problem, many of which ends users may not think of, but applications developers think a lot about. The first fruit of the Technology Gem Initiative is SubD-NURBS.

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Define, Manage Fasteners in Complex Airframe Assemblies

Company says SyncroFIT 2010 reduces design time.

SyncroFIT from VISTAGY targets fastening systems in aircraft and air structures. It enables you to define and manage fasteners, joints, and interfaces between parts within complex airframe assemblies. There are a gazillion fasteners of all types and sizes in even the smallest planes. Manually tracking the type, location, fastening requirements, materials, and cost for each one of them is a monstrous job. Then making that data available with accuracy throughout the design, supply, manufacture, and assemble processes is even more monstrous. Getting a rein on all that is what SyncroFIT does, and it's off-the-shelf, ready to go.

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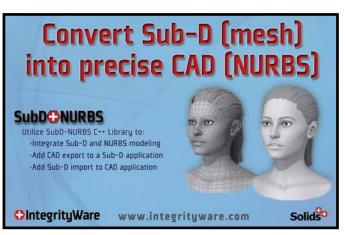


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Quick and Easy

Geomagic Studio helps OtterBox satisfy the simultaneous

needs for better, faster and more.

If OtterBox, a case maker for mobile devices, were a cartoon character, it would be standing tall with a gnomish character perched on each shoulder whispering seemingly opposing advice. One would be saying "faster, faster," while the other would be urging "more, more."

OtterBox believes it can now satisfy both camps, while maintaining the rugged quality for which the company's products are known. One of its central



tools for meeting seemingly conflicting goals is 3D reverse engineering using Geomagic Studio software.

Finding the Right Tool

In early 2010, OtterBox transitioned from outsourcing most of its reverse engineering work to bringing it in-house using Geomagic Studio. This happened after a series of frustrations with another reverse engineering package.

"The first reverse engineering software we tried was like learning a new CAD package," says Zach Dunkin, OtterBox's product development technician. "It was difficult to use, and the surface offsets wouldn't work. The time I would have invested in using it effectively would have been too great. In contrast, I was able to generate 13 surfaces for cases that came to market in the first six months of using Geomagic."

The difference, says Dunkin, is the ability to generate clean, crisp surfaces from scan data of the actual device whether smart phone, iPod or iPad — for which OtterBox is making a custom case. In the competitive market in which OtterBox plays, there is little room for reworking: The finished product must fit like a glove right out of the box.

Small Window of Opportunity

"We're in a market where the life cycle of the product is very short, typically 10 to 12 months," says Alan Morine, OtterBox's research and development manager. "We have to get the product out quickly, or else the market opportunity decreases exponentially."

The pressure is further increased by the number of products hitting the market and the consumer's hunger for variety. OtterBox started with cases for the BlackBerry and iPhone, but has rapidly expanded to cover other products from Apple, as well as devices from Motorola, Nokia, Palm, HTC and others. To meet that small marketing window, OtterBox products need to come out simultaneously with the devices, or only a couple of weeks afterward.

INFO → deskeng.com/articles/aaazrt.htm

Designing the 'Brains' for Automated Manual **Transmissions**

LMS Imagine.Lab AMESim helps Renault bridge the development gap among mechanics, electronics and control software in this hard-to-design system.



One feature many of today's consumers look for in a new car is an automated manual transmission (AMT) — systems that behave like automatics, but also allow drivers to shift gears electronically using a push-button command without a clutch pedal. AMTs combine the fuel efficiency, performance and control of manual systems with the convenience of automatics, an especially handy feature in stop-and-go traffic.

With the ease and convenience appreciated by many drivers facing daily traffic congestion, automakers are equipping a growing number of new vehicle models with these types of transmissions. Indeed, a report from market research firm Frost and Sullivan predicts 15% of small cars will likely feature AMTs by 2012.

These complex mechatronics systems are difficult to design, however, because their performance depends on the operation of three different subsystems all working together in perfect synchronization: an electromechanical actuator that shifts the gears, electronic sensors that monitor vehicle status and software embedded in the transmission control unit (TCU) — the "brains" that control the powertrain.

French automaker Renault S.A. is streamlining the AMT development process with a simulation-based approach: It's using LMS Imagine.Lab AMESim 1D simulation software to predict the performance and real functionality of complex multi-domain systems using a single, unified, physics-based model. Engineers drag, drop and interconnect simple icons to graphically create the model, displayed on the screen with a working sketch showing relationships of all the various elements to predict the behavior of an entire AMT system.

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Custom ATE Eliminates Guesswork

Ensure the success of advanced and emerging technologies via functional testing with Autotest's application-specific automatic testing equipment.



Taking breaths away at the most recent Geneva Motor Show, the prototype Porsche 918 Spyder does 0 to 62 mph in 3.2 seconds while getting up to 78 mpg with the help of electric motors that generate 218 hp. Here, technology achieves its promise to deliver progress in an environmentally friendly way. But how do you test such new automotive technology for production volumes? It's not like Porsche engineers can purchase a commercially available tester for its complicated motive system.

Project managers now increasingly look to custom designed and manufactured automatic testing equipment (ATE) that can functionally test new units that employ advanced technologies.

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Taking the Lead

High-tech wind tunnels, sophisticated particle image velocimetry and leading-edge Tecplot visualization software help Toyota Motorsport gain the competitive edge.



The stakes in top-level automobile racing are enormous: careers, sponsorships, corporate reputations, products and untold millions in various forms of revenue are on the line for racing teams and carmakers. Teams in Formula One devote nine-figure annual budgets in the search for that little bit of edge that might yield just tenths or hundredths of a second on the racetrack.

Aerodynamics is one of the most important areas that teams and manufacturers look at in their search for such improvements. They rely on some of the world's top computational fluid dynamics (CFD) and particle image velocimetry (PIV) engineers to find those tiny fractions of a second.

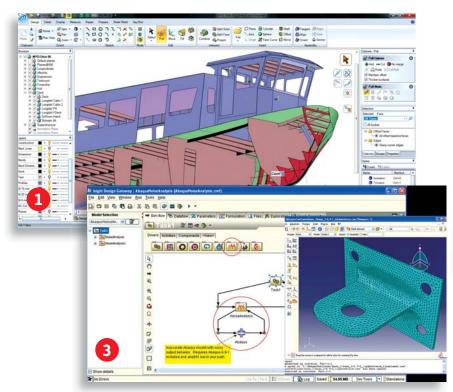
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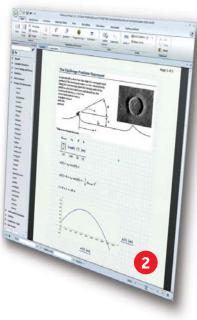
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SpaceClaim has announced product enhancements designed for large manufacturing organizations that want to move to upfront concept modeling. SpaceClaim 2011 includes enhancements to surface modeling, large assembly performance, model preparation for CAE and manufacturing, and enterprise integration. These capabilities align SpaceClaim with manufacturers' business imperatives such as removing waste from product development, tightening product development costs, and using simulation more pervasively in engineering. New capabilities in SpaceClaim 2011 range from increasingly accessible surfacing, assembly, and model preparation enhancements to strengthened sheet metal and CAD interoperability features.

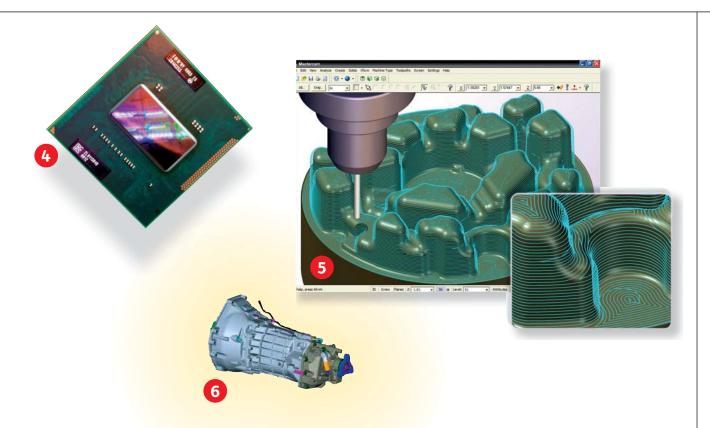
Highlights include a new capability to select faces by area and expedite volume extraction for CFD and mold design; new sheet metal capabilities; mesh data can now be directly reused to make 3D models; and the TraceParts content library is now provided as a free online service for all users. spaceclaim.com

PTC has announced Mathcad Prime 1.0. the next generation of the company's engineering calculation software. The capabilities of Mathcad coupled with its open architecture and live mathematical notation functionality is meant to allow engineers and organizations to streamline critical design processes. Mathcad Prime 1.0 delivers a new tasked-based user interface, enabling engineers to focus on developing engineering calculations rather

than formatting design documents. Mathcad presents calculations, text and images, enabling knowledge capture, reuse and design verification, which can result in improved product quality with faster time-to-market, according to the company. It integrates with other PTC products including Creo Elements/Pro (formerly Pro/ ENGINEER) and Windchill. ptc.com

Dassault Systèmes (DS) has announced the availability of Isight 5.0, an open desktop solution for simulation process automation and design optimization from SIMULIA. It provides designers, engineers, and researchers with an open system for integrating design and simulation models — created with various CAD, CAE and other software applications — to automate the execution

of simulations. The company says it allows users to save time and improve their products by optimizing them against performance or cost variables through statistical methods such as design of experiments (DOE) or design for Six Sigma. The new Eclipse plug-in within Isight 5.0 provides an interface and common-component project templates. Through the Component Integration Program (CIP), SIMULIA is facilitating the delivery of components to help ensure partner tools can be automatically and seamlessly leveraged as parts of Isight simulation process flows. Additional support for DOE methods is also now available in Isight 5.0, including the Fractional Factorial method and the Box-Behnken method, Isight 5.0 provides the MATLAB component at no extra charge



and the Taguchi Method component is now part of the PRO pack. simulia.com/products/

isight.html

Intel, AMD and NVIDIA all announced new products at this year's Consumer Electronics Show. Intel Corporation introduced its 2nd Generation Intel Core processor family. The chips are based on the company's 32nm "Sandy Bridge" microarchitecture. New features include Intel Insider, Intel Ouick Sync Video, and a new version of the company's Intel Wireless Display (WiDi). which now adds 1080p HD and content protection for those beaming HD content from their laptop screen to their TV. AMD has launched a new class of accelerated processors that combines multiple com-

pute capabilities. The AMD Fusion Family of Accelerated Processing Units (APUs) incorporate — in a single die design — multicore CPU (x86) technology, a DirectX 11-capable discrete-level graphics and parallel processing engine, a dedicated high-definition video acceleration block, and a high-speed bus. NVIDIA announced that it plans to build high-performance ARM-based CPU cores, designed to support future products ranging from personal computers and servers to workstations and supercomputers. Known as "Project Denver," it features an NVIDIA CPU running the ARM instruction set, which the company says will be fully integrated on the same chip as the NVIDIA GPU.

intel.com, amd.com, nvidia.com

CNC Software's Mastercam X5 Mill offers expanded machining flexibility and an increased emphasis on speed and automation. Smart Hybrid Finishing, new dynamic milling techniques, and ISCAR support combine with dozens of additional new enhancements in a package intended to improve shop floor productivity. Other new enhancements include new dynamic milling techniques that constantly adjust the toolpath, dynamic contouring to remove material along walls, and feature based machining (FBM) enhancements. mastercam.com

MSC.Software **Corporation** has released Adams Gear Advanced Technology, The new toolkit is a plug-in to the dynamics program

MD Adams from MSC. Software. According to the company, the customized gear simulation environment enables engineers to use a single and scalable simulation tool for the complete design process of transmission systems, high fidelity systems simulation including detailed gears and bearings, and optimization. The combination of MD Adams and transmission specific methodologies built into its environment allows design teams to rely on both design approaches: statics as well dynamics. The same model used for static analysis throughout the design process can be used to perform dynamic studies of the component transmission and/or full system modeling. Dynamic effects like gear rattle can also be observed. Mscsoftware.com

High-Speed Sampling

The Measurement Computing LGR-5320 devices perform high-speed measurements, up to 200 kS/s, directly to a Secure Digital (SD) memory card. A 4GB SD memory card is included, but the series supports up to 32GB for collecting up to 16 billion measurements.

Multiple Inputs

The data acquisition loggers feature 16-bit resolution, 16 analog and 16 digital inputs and four encoder inputs. All inputs are sampled synchronously.

Triggering Options

Using the analog and digital triggering options, users can collect data to monitor systems and events without dedicating a PC.

Software Included

The LGR-5320 loggers ship with DAQLog software to configure the devices and retrieve data via the USB interface or SD memory card.



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Available Models

The LGR-5325 features up to ±10 V analog inputs, 100 kS/s sampling, four standard counter inputs (non-quadrature), and single-channel analog/digital trigger modes. The LGR-5327 features up to ±30 V analog inputs, 200 kS/s sampling, four quadrature encoder inputs, and multi-channel trigger modes. The LGR-5329 includes all the functionality of the LGR-5327 plus isolated digital inputs.

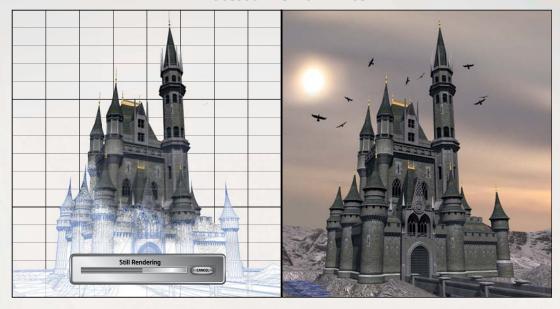
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